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THE CASTING OF ARTISTIC WORK.

By W. N. Nelly.

The efforts made of late in reaching the goal of making perfect castings in non-ferrous metals by the different methods have culminated in many discoveries, if we want to so designate them—or better—in finding out things which tend toward perfecting the final results. I shall now go over a few of the ways in which many have been making efforts and we shall see what the result has been.

It has been a custom in casting artistic bronze pieces of statuary, for instance by the old-fashioned sand molding process, to cut the original plaster model into a large number of pieces and fit every piece that had been cut with a mounting which would permit them to be put together after casting the work in bronze. And this is particularly practiced when the work is in a hurry and each molder takes one piece. To illustrate: Take a high relief 8 feet by 10 inches, with about 10 figures, some of which are raised entirely or partially from the background, and what will the result be?

AN ARTISTIC CASTING—STATUE OF GEORGE WASHINGTON.

In the first place a first-class plaster molder will have to work steady for a week or ten days making the necessary mountings; and after this has been done and the work cast, you will find that the casting weighs just about twice as much as it ought to on account of all the extra bronze for the mountings; in addition there is the work of putting the pieces together.

Well, would it not be possible to find a more practical and economical way of casting such a piece? Yes, it is possible, and a very successful method I shall mention.

Instead of cutting your model into so many parts, remove with a wire saw a little piece here and there (which of course will be molded separately, cast in wax and stuck on the wax model) and make a nice glue mold over the model; and that will be the starting point for getting the perfect reproduction of the model in wax from which it is a comparatively easy matter to make a lost-wax mold.

In the finishing shop the extensive use of emery wheels of all kinds, mounted on different styles of trucks and operated with small electric motors, has been the means of getting a perfect finish at little expense on memorial tablets and some kinds of architectural work.

I shall briefly go over a very prominent step taken toward the solution of the problem: What is the best substance in which to pour your metals? We know the properties of a number of substances, viz.:

Sand of the different kinds and mixtures.

Fire clay or brick dust.

Pumice stone, asbestos, hard coal ashes, etc., classifying these materials according to the time they were brought into use.

The feature of the above-mentioned materials is that each one is particularly adapted, for some reason or other, to some particular kind of foundry work. The problem before us has been to find the best substance to use for the highest class of gold and silver castings that could be extended to very high classes of bronze castings as well. This has been a very serious problem, perhaps the most serious, and every foundryman who handles the finest grades of work knows this.

Through the long and patient research of J. Janitscheck a combination on which he has obtained patents is composed of plaster, hard coal ashes, whiting and other ingredients. This seems to have wonderful properties and I can assure the trade that the results obtained by it are perfect, and furthermore I can safely say that any kind of work can be done; from the highest grade where perfect surface is required to the finest gages, and even solid pieces.

In a future article it is expected to take up this mixture more in detail and also show some of the results.

BRASS CASTINGS.*

By J. L. Jones.†

The art of the brass founder dates back beyond the dawn of history. It is probable that the first brass founder made his mixes by what may be called "the direct process," mingling the copper, zinc, tin and lead ores together and reducing them with charcoal, pouring into ingots and remelting. Quite a variety of alloys could be made in this way, but unless the ores were very pure, many objectionable impurities would be introduced. The Japanese and Chinese at the present time cling to these antiquated methods in some localities, but so great is their skill that fine results are obtained. The writer some time since made an examination of a Japanese bronze lantern that was a beautiful piece of work. The top of the lantern was a circular plate 5¼ inches in diameter and only 1-16 inch thick. Its upper surface was profusely ornamented and every detail was so distinct that it showed that a very fine grade of molding sand had been used and that the bronze was very fluid when melted. The casting was rather brittle but it had a beautiful patina or surface color. Its composition was as follows:

Copper	80.25
Lead	6.55
Tin	2.12
Zinc	nil
Iron	.14
Arsenic	9.17
Antimony	1.91
Nickel	.45

A bronze of this character could hardly have been made from ingot metals.

It has been charged that the modern brass founder is not progressive and that he clings to antiquated methods. This is hardly true in the United States and there are few industries in which there has been as much improvement in the last ten years as in brass founding.

A typical brass foundry of the "old school" in a neighboring city was visited by the writetr recently and the following description of it will afford an opportunity of comparing it with the modern brass foundries. The foundry in question was about 30 feet by 20 feet and employed two men in addition to the proprietor. There were two crucible furnaces and a heat of 1,200 pounds could be poured. The core oven was an old cook stove and coke was bought by the wagon load, while the molding sand was dug from the neighboring lots. This brass founder knew how to make solid copper castings, he could put 30 per cent. of lead into a casting without it separating, and do other stunts of this kind that are supposed to mark a man as up-to-date, but he realized that the time was not far off when he could no longer compete with a modernly equipped brass foundry and was preparing to retire from business, and enjoy the comfortable fortune he had made.

At the present time brass foundries often rival iron foundries in size and equipment. In most of the larger plants, crucible melting has been supplanted by the use of oil-burning furnaces of the Schwartz and other types with the result that the melting is done for about one-half the cost of crucible melting and the melting losses are only about one-half the losses experienced when crucibles are used. To obtain these results, experience and careful handling are required. Any alloy or metal used for making castings from copper down to aluminum or zinc can be successfully melted in an oil melting furnace, and the use of such furnaces is one of the most striking advances that has been made in brass foundry practice in recent years.

MOLDING SAND.

In the making of brass castings, the selection of a good molding sand is of first importance, and should be chosen to suit the work in hand. Brass sands as a rule differ little if any from the sands for making iron castings. If anything they are rather inferior to iron molding sands. Brass having a lower melting point than cast iron requires a less refractory sand and considerable amounts of mica and other slag forming materials may be present in a brass sand, especially if the castings are light. The Philadelphia sand, for instance, gives very good results with light brass castings but it contains so much clay and mica and is so fine that it would not do at all for iron castings. The well known French sand used for statuary work surpasses all molding sands in toughness and "body," although both its chemical and physical composition differ but little from that of standard Albany sand. Possibly the unusual qualities of French sand are due to the great plasticity of the clay which bonds its grains together.

Below are given a number of chemical and mechanical analyses of typical brass sands, the mechanical analyses being made by Hilgard's method:

	Chemical Analyses.								Mechanical Analyses.							
Name.	Ignition.	Silica.	Alumina.	Iron Oxide.	Lime.	Magnesia.	Potash.	Soda.	Pebbles.	Coarse Grits.	Fine Grits.	Coarse Sand.	Fine Sand.	Coarse Silt.	Fine Silt.	Clay.
Philadelphia	4.00	71.60	11.49	7.81	.65	.95	1.42	1.27	nil	nil	.37	.61	70.97	9.27	13.63	4.05
Albany	2.50	81.45	7.30	4.10	.90	.68	1.40	1.38	nil	nil	.36	6.98	49.80	35.42	3.25	2.07
French Statuary	2.65	85.08	5.10	4.00	1.20	.25	1.28	.34	nil	nil	nil	4.40	44.05	28.64	18.56	3.77
Mild Lumberton	3.25	86.80	3.05	5.32	.15	.65	.83	.04	nil	5.45	14.55	29.90	31.50	8.95	6.35	3.15
Strong Lumberton	3.10	84.28	4.50	6.10	trace	.72	.91	.39	nil	6.95	18.45	38.40	19.20	6.25	7.40	3.20
Millville Gravel	2.20	87.00	6.70	3.20	nil	nil	.25	.65	.05	49.15	28.35	7.05	1.40	7.80	2.20	3.75
Poor Gravel	8.05	65.10	17.65	7.90	.50	nil	.70	.02	18.60	4.40	5.30	4.80	6.00	19.30	6.70	34.90
Charlesville French	2.81	81.26	5.69	4.29	4.34	.36	.87	.38	nil	nil	nil	.20	67.74	16.03	12.58	2.87

The high price of the French sand renders its use prohibitory for most work. The rather large amount of lime in the two samples given above is noteworthy.

Some brass founders make a practice of adding common salt to the water used for tempering molding sand, using about 4 ounces to a bucket of water. The only advantage derived from the use of salt is due to its taking up moisture and making the sand stick together, so that it will not wash before the molten metal, and hence give a smooth casting. The use of much salt will prove detrimental, as it adds a fluxing ingredient to the sand and makes it liable to burn on a casting.

METALS USED FOR MAKING BRASS CASTINGS.

Of the metals used in making brass castings, copper, tin, zinc and lead are the most important, and they rank in the order named. Other metals, such as aluminum, nickel, iron, manganese, antimony and magnesium are sometimes used, as well as the metalloids, phosphorous and silicon.

Copper.—Copper is generally used in the ingot form. As the best brands of lake copper are largely bought up by the wire makers, electrolytic copper has to be used

*A paper read before the Pittsburg Foundrymen's Association, Jan. 7, 1907.

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now by many founders who would much prefer the lake copper. The best grades of electrolytic copper are, however, equal to, or superior to, the best grades of lake copper. Among the best brands of lake copper may be named the Calumet and Hecla, Quincy, Tamarack, Osceola, etc. The Baltic, Champion and Trimountain were once ruled off the New York Metal Exchange for arsenic content, but it was only for a short time, and these brands are as good as any for brass castings. Some buyers think that nothing will do for their work but Calumet and Hecla, not that it is any better than other brands, but being a large producer its copper is of uniform quality and the buyer gets used to the product and will have nothing else.

Among the best electrolytic brands are the Copper Queen, L. N. S., O. E. C., D. R. W., P. A. C. and M. O. C. O. C. O., but it is only necessary to use these when making copper castings. For ordinary work, scrap wire or strap, or the common grades of casting copper, may be used. Scrap wire could be used for copper castings if it were not for the soldered ends.

the required ¼-inch diameter turned from it and tested as above. No corrections for temperature have to be made. Tests are made on brasses and bronzes that are not forgeable by casting them into ingots or rods and turning these down on a lathe, provided with a support to keep the rod from buckling.

The conductivity of annealed copper is about 2 per cent greater than when it is hard drawn or hammered cold. A specification that required high grade lake or electrolytic copper to have a conductivity of 97 per cent hard drawn and 99 per cent annealed would shut out all inferior brands. Casting brands of copper for ordinary work could be bought on a basis of 99.5 per cent metallic copper.

TIN.—This metal has been increasing in value so rapidly that all brass makers are hunting something to replace it. Straits tin is the best and perhaps in the long run the cheapest that can be bought. There are various brands of cheaper qualities of tin on the market. The Lamb and Flag brands produced in the south of England

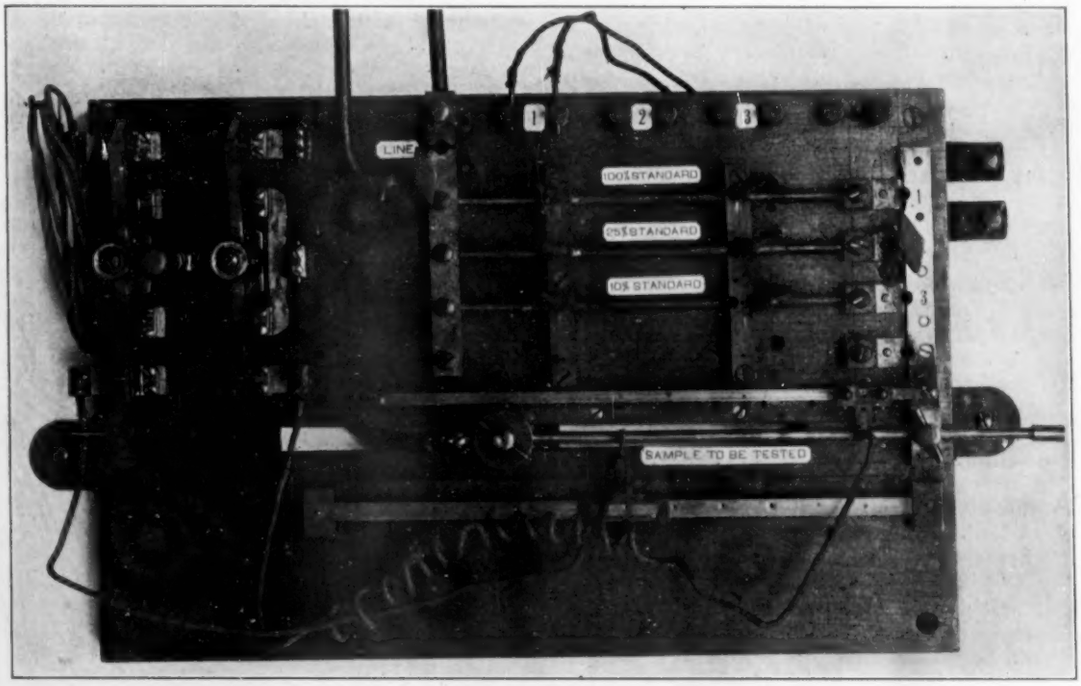


FIG. 1. TESTING COPPER FOR PURITY.

The best method of ascertaining the purity of copper is by taking its conductivity. High grade lake and electrolytic copper run very close to 100 per cent conductivity and analyze 99.9 per cent copper. The Westinghouse Electric & Manufacturing Co. uses the apparatus shown in Fig. 1 for testing the conductivity of its brass mixtures, copper, etc. It is both suitable for testing metals that can be drawn into wire, like copper and others that cannot be forged, such as red brass, etc., while it is rapid and sufficiently accurate for all practical purposes. The board carried three standard rods of ¼-inch diameter, which are made of copper, brass and German silver and have a conductivity of 100 per cent., 25 per cent and 10 per cent, respectively. The rod to be tested must be of similar diameter to the standard. It is balanced against the standard and its conductivity read off on the scale. In addition to the board, an ammeter and voltmeter are required. In testing copper an ingot is taken at random from a carload lot and forged into a bar about ½-inch square by 12 inches long. This is annealed and a rod of

mines have a good reputation, and next to Straits are to be preferred because free from antimony and arsenic. Bolivian tin contains, as a rule, too much antimony to be used for castings, but it may be refined to a high degree and rendered more acceptable. The various brands of Straits tin are practically all alike, and they are said to be smelted by a single syndicate so that it matter little whether the pigs are branded Penang, Behn-Meyer & Co., Gilfillan-Wood & Co., or what not.

SPELTER OR ZINC.—The brands of zinc known as prime western spelter are good enough for most classes of brass castings, as they seldom contain more than one and five-tenths per cent of lead and only traces of other impurities. In some government mixtures that require unusual strength, Bertha and similar grades of zinc that are free from lead must be used. Slabs of zinc that have a fine grain may be suspected of having been made from kettle-refined dross and of containing considerable iron. There have been recently put on the market several brands of zinc that are made from the direct distillation of gal-

vanizer's dross. Some of this zinc is extremely pure, but it has not found a very ready market, because a much higher price is asked for it than prime western spelter brings. Among the brands of this zinc may be mentioned M. H., Premier, Solar, and Golden Rod.

The brands of western spelter are quite numerous and nearly all of them run about the same in quality. Among the brands may be mentioned Lanyon, Granby, Sandoval, Illinois, A. B. C., and Rich Hill. They are made from ore.

Kettle-refined spelter is often of excellent quality, even though made from galvanizer's dross. When double refined, it is superior to prime western spelter. The diamond "S" brand is especially of good quality.

Occasionally when prices are high a little Silesian zinc is imported but it is in no way superior to prime western spelter.

LEAD.—It is generally thought that all brands of soft lead contain only traces of impurities and are equally good. But brass founders who watch their losses carefully will find that the melting loss on some brands is only about ¼ of one per cent while on others it may exceed three per cent. Some brands are made from argentiferous or silver bearing ores and others from non-argentiferous ores. The brands known as "Chemical leads" usually give the most loss in melting. Freedom from dross and oxides rather than analytical purity is what the founder wants in his pig lead. Among the brands on the market may be mentioned Federal, Granby, St. Joe Picher, etc.

BRASS MIXTURES.

Mixtures for brass castings are so numerous that one can only touch the high spots in speaking of them.

RED BRASS.—Of the mixtures of red brass that are in use, few if any can compare with the well known "88-10-2" for all-around excellence. This consists of 88 parts of copper, 10 of tin and 2 of zinc. For general fittings, machinery castings, valves (especially large valves), condensers, steam pipes, etc., it gives very good results, as it is strong, tenacious and runs well in casting. For government work this mix is required to be free from lead, as lead greatly decreases the tenacity of castings both when they are cold and hot. Lead is usually supposed to be added to brass mixtures in order to make the castings machine easily. It does this because it decreases the strength of the metal. The quality of brass castings would be greatly benefited if lead were banished from the brass foundry entirely, although there are some bearing bronzes in which its use may be necessary.

YELLOW BRASS.—The government mixture of 67 parts copper and 33 parts zinc is about as cheap a yellow brass mixture as any. Its running qualities are improved by a little tin which also stiffens it up for it is rather soft. It is the practice in some localities to add aluminum to both red and yellow brass in order to improve its running qualities, but conservative brass founders prefer to keep aluminum out of their foundries, especially where castings have to stand an air or water test.

SCRAP.—Where no strength is required, scrap can be used to advantage and it is customary to load it up with all the lead it will stand in order to cheapen the product. Scrap if free from iron is really better than new metal as far as uniformity is concerned, because the remelting amalgamates its constituents and thus improves it.

PHOSPHOR BRONZE.—Phosphor bronze usually consists of copper, tin and phosphorus, and it is an unwritten law that zinc must be kept out of it. In some foundries phosphor bronze is made by throwing a small stick of phosphorus an inch or two in length into a crucible of metal, when it is brought from the furnace. The phosphorus floats about on the surface and burns, doing the metal little if any good. Others go to the opposite extreme and use from 1 to 2 per cent with the result that segregation and blowholes occur in the castings. One pound to the hundred will usually thoroughly deoxidize the metal unless it is very dirty. Phosphor-copper is much to be preferred to metallic phosphorus, as the latter is uncertain in its action and dangerous to handle. It may be rendered less inflammable by putting it in a solution of bluestone and thus coating it with copper. Phosphor-copper may be had on the market up to 15 per cent phosphorus, and it gives a stronger, tougher, more uniform alloy than when phosphorus is used, and the sand does not burn on the castings to such an extent.

The standard mixture for bearings consists of copper 79.70, tin 10, lead 9.50 and phosphorus 0.80.

LEAD BRONZES.—Various mixtures which contain as high as 30 and even 50 per cent of lead are being recommended and used to some extent for bearings. They do not give as satisfactory results as standard phosphor bronze, being deficient in strength. This lack of strength combined with lack of ductility causes the bearings to flake. These alloys also are difficult to handle in the foundry.

COPPER CASTINGS.—What are called "pure" copper castings are usually required for electrical use and must not only be sound castings, but possess high conductivity also. Both these requirements may be attained by casting high grade electrolytic copper into metal molds, but this method can only be used where the castings are plain and wanted in large numbers. In most cases the castings must be made in sand, and this renders it necessary to add some deoxidizer to the molten copper in order to secure a casting free from blowholes. If an excess of the deoxidizer is added, the conductivity is lowered. Silicon has proved the best material to use, but on account of its high melting point it is added preferably as silicon-copper containing 10 per cent of silicon. The maker of copper castings should make it a rule to select one brand of copper and use no other, for the more brands he uses the more variables he introduces into his practice and the less likely is he to obtain castings of high uniform conductivity.

MANGANESE BRONZE.—There is a large and increasing use of this alloy for automobile castings, and other situations where cast brass is not stiff enough. The making of castings from manganese bronze offers no especial difficulty if it is remembered that its shrinkage is unusually high. It runs well and thinner castings may be made from it than from yellow brass. On account of its great strength, the weight of castings may often be cut in half by using it instead of red or yellow brass. On account of the large amount of zinc it contains it is liable to run scruffy, and for this reason it is necessary to bottom-pour all castings. The mixing of manganese bronze is a difficult operation and it is best for the small user to buy his ingot. A number of brands of manganese bronze are on the market, some of them being of excellent quality and others far from satisfactory.

VENTILATION.—The tendency in present foundry practice seems to be toward brasses containing more and more zinc and toward the use of oil melting furnaces instead of the old crucible furnace. The aim in all oil melting furnaces is to obtain perfect combustion, producing the maximum heat from the oil consumed. When this is done only carbon dioxide gas is discharged from the furnaces. This gas is not poisonous in the ordinary acceptation of the term, except as it vitiates the air of the foundry. Under actual working conditions, however, combustion is far from perfect and large volumes

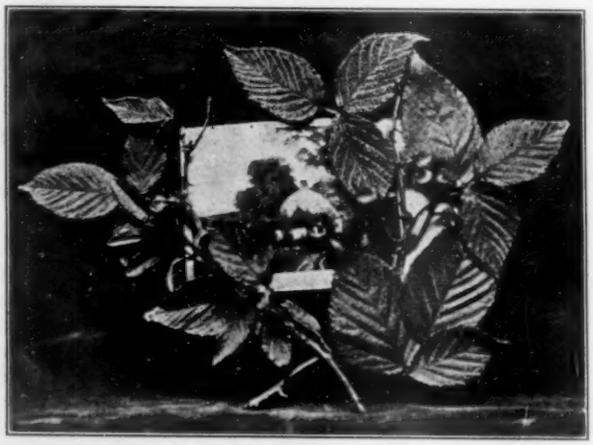
of the very poisonous carbon monoxide gas are often discharged from the furnaces. The fumes of zinc oxide, which come from the furnace, and from the pouring crucibles, often give trouble in the winter season when windows have to be kept closed. Poisoning by zinc is known among the workmen as "spelter shakes." The symptoms that may be produced are coughs, stomach trouble, paleness and a dirty gray skin, with blindness at night and chills. After a time there is developed a kind of paralysis and tremulous movements of the body.

When a foundry is large and roomy the gases and fumes seldom give trouble. When possible they should be removed by down-draft ventilation, because both carbon monoxide and dioxide are heavy gases while zinc oxide and the other metallic fumes are heavier yet. Most of the larger brass foundries provide excellent wash rooms and even shower baths. The men should never be allowed to eat their lunches in the foundry unless it is absolutely necessary. The hair, beard and nails should be kept short, so as not to take up the dust and respirators may be worn by the men pouring off. Shops that pour off continuously have to take greater precautions than those that pour off at 11 a. m. and 4 p. m.

METALLIZING FLOWERS AND OBJECTS IN BELGIUM.

Consul General George W. Roosevelt, writing from Brussels, reports the successful development there of a new method of making bronze plated objects as follows:

"The first attempt at metallizing objects was known to the industrial world as long ago as 1861-1866, when unsuccessful efforts were made to metallize flowers, fruits,



METALLIZED FLOWERS.

etc. After six years of laborious research and experiments, H. Monge and C. Arzano succeeded in perfecting the art and recently established a factory at 17 Rue d'Irland Saint-Gilles, Brussels, for the manufacture of bronze-plated art objects, ancient and modern. By their process, the secret of which they jealously guard, they are enabled to metallize even so delicate a thing as lace or a rose in full bloom.

"The object of this establishment is to place handsomely finished metallized objects on the market in every particular equal to, but at one-eighth the cost of cast bronze, and to immutably fix the incomparable forms Nature gives to her products, such as flowers, leaves, fruits, insects, etc. These the most skillful have heretofore only furnished fair imitations by covering the object by electrolytic means with an exceedingly thin but as dense as possible coating of brass, which transforms the natural objects into bronze.

"Without disclosing secret methods of metallizing, no hesitancy was observed concerning a description of the length of time that objects were retained in what is known as the bath. The length of time varies according to the character of the object and the complications of its detail from twenty-four to seventy-two hours. The subjects selected for metallizing are generally well-known works of famous artists, objects for decorative purposes and artistic objects, such as card and ash receivers, frames, etc. The finished articles, which resemble in weight, texture, color, etc., real bronze, are entirely different from any manufacture now on the market, as they are declared chemically pure copper and not a mixture or composition. Julius and Arthur Hart, of Indianapolis, Ind., and Los Angeles, Cal., are representing members of the firm in America."

We might state for the general information of Consul General Roosevelt and others that work of this character has been long done in this country. There are concerns here who will plate any article from a life-sized plaster cast to the most delicate flower. Among these are the Art Metal Works of New York City, the Convertible Metal Manufacturers, of Greenpoint, N. Y., and L. G. Delamothe, of North Chicago, Ill.

We herewith show some of the work by Mr. Delamothe, which is a picture frame made from metallized black berry and wild rose leaves, and which is now with other specimens of his work being exhibited at the Chicago Academy of Fine Arts.

A complete description of the several methods of metallizing non-metallic substances have been published in THE METAL INDUSTRY. In our May, 1906, number we printed an article entitled "The Deposition of Gold, Silver and Copper on Non-Metallic Surfaces," by Edward E. Newton, which is probably the most practical paper on the subject which has ever been published.

FIGHT ON BOGUS JEWELRY, SILVERWARE, ETC.

Leading manufacturers of jewelry, silverware, watches and optical supplies have taken the preliminary steps toward the formation of an organization to advocate in all States the passage of laws in accordance with the provisions of the National Stamping Act passed by Congress last winter. This law goes into effect June 13 next. All the State Legislatures will be petitioned to adopt uniform laws. This action will be taken for the reason that it is not believed the Federal laws will be effective without some such co-operation on the part of the States.

The movement is not confined to New York City or its vicinity but embraces manufacturers and handlers of the precious metals throughout the country. Back of the agitation are those who were instrumental in the passage of the Stamping Act which prohibits false stamps on gold and silver articles entering into inter-State or foreign commerce. The law it is proposed to introduce in the several States based on the Federal law provides that if articles made of gold have any stamp or mark of quality the metal must not show an assay more than one-half carat divergence from such standard. In the case of gold watch cases and other flat articles the divergence must not be more than 3-1000 parts, and in solid silver not more than 4-1000 parts is allowed. The bill carries a penalty of $500 fine or imprisonment of not more than 3 months, or both.

The United States makes the best machinery and England sells the most. In 1904 the exports from this country amounted to $82,078,000 and from the United Kingdom $102,531,800.

THE MANUFACTURE OF GERMAN SILVER FLAT WARE.

By C. W. Cook.

In the manufacture of German silver flat ware, so called, such as spoons, forks, etc., it first becomes necessary to procure first-class metal made and adapted for this class of goods. The article in The Metal Industry for January, 1907, by Thomas Clare, gives the correct method of making German silver for this purpose.

Nearly all flat ware manufacturers have their German silver made in sheets of proper width and thickness for the size and weight of goods to be made. The first operation is to cut the sheet into blanks, as shown in Fig. 1. The blanking process illustrated and generally used is the interlocking blank, one blank interlocking with the next so that the loss of metal in the shape of scrap is reduced to a minimum and in some shapes is entirely obviated. The next operation is cross rolling, which is the spreading of both the bowl and handle ends to the width required to cut out the article wanted. Fig. 2 shows a blank cross-rolled ready for the grading rolls. The blank is now wide enough for the work

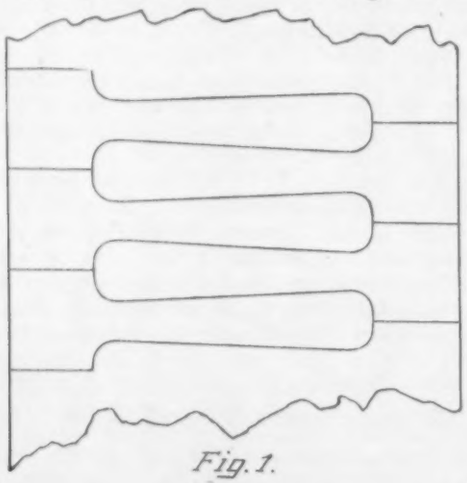


Fig. 1.

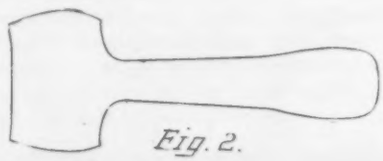


Fig. 2.

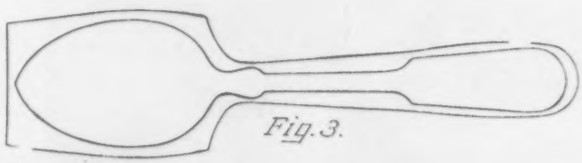


Fig. 3.

THE VARIOUS BLANKS.

but is too short. It is therefore passed through the grading rolls, which make it long enough and at the same time correct any imperfection there may be in the thickness of the sheet from the point of the bowl to the end of the handle. The blank, now being correct in thickness, width and length, the piece for the spoon is cut as indicated in Fig. 3.

Up to this stage the operations on forks and spoons are practically the same, but in the case of a fork there are no tines; these are cut in a press with properly shaped dies, the result being as shown in Fig. 4. While the blanks are now suitable as to shape, the grading process has made them so hard that they cannot be further operated upon until after annealing. This work must be carefully done, as under-annealing will leave the blanks still too hard and over-annealing will start the spelter from the metal and render it porous, rough and useless for the purpose.

After the flats have been thoroughly and evenly annealed they are put through acid baths which remove the discoloration caused by the heat and leave them clean and bright. They are now ready for the striking up process, which raises the figure of the pattern to correspond with the depth in the dies. This striking process also hardens and tempers the articles, but not enough to produce brittleness. Some deep-cut figured patterns require several blows under drop hammers weighing from 400 to 12,000 pounds.

After each blow of the hammer the article must be annealed, and the striking and annealing are repeated until the figures have been brought out full and correct. The article is now satisfactory in figure and temper, but very rough along the edges, so it is removed to the trimming department. This work is done on wheels and belts made and shaped according to the form of the piece. The wheels and belts are coated with very fine emery and bolted grit; this leaves the article practically smooth. On forks it is necessary to trim between the tines to make the inside of the tines as smooth as the outside. This operation also makes the proper point of the tines.

Although much has been done upon it the article is still very unfit for plating, so it is taken to the finishing department where it is given the proper plating surface. This is done on belts and wheels so shaped as to reach all the different parts of the fork or spoon. Bright or high color is not essential for a good plating surface, but there must be a smooth even surface at all portions. In the finishing process we use various oils, grits, compositions, etc., to get the desired results. In order to make certain that this work has been perfectly performed the article is thoroughly and rigidly inspected. If any defects appear the blank must be returned to be retrimmed or refinished, as the case may be. The qualities of a first class inspector are thorough knowledge of the processes, good eyesight, and a quick and positive judgment on all work handled.

Our work is now ready for plating, which is a most important feature. We must know that the correct amount of silver is deposited on each and every article. To be positive of this most manufacturers have a system of weighing the goods before and after plating, thereby insuring full weight of plate on all grades of goods. One splendid feature of the plating process is the sectional plate which, as a rule, is done before the goods are plated all over. This consists of first plating the points of the bowls and tines and backs of bowls, tines and handles, as these are the parts most exposed to hard wear, and the extra amount of silver deposited at these points goes a long way in the wearing qualities of the plate. After being plated sectionally the work is plated all over to meet the standard weight of goods called for.

All articles of same weight before plating and same quality of bare metal represent practically the same value, but the amount of silver deposited changes the value.

For instance, one dozen spoons of any weight plated with 8-ounce plate are not of the same value as the same spoons would be with 16-ounce plate; and though the appearance is the same, the wearing qualities of the 16-ounce plate are far greater. After the plating has been completed and the goods properly stamped with the name and weight of plate, the articles are then burnished to lay the plate as hard as possible without scratching or roughing the silver. The harder the silver is burnished the longer it will wear if no silver is removed by the process. After all bright work has been burnished we proceed to

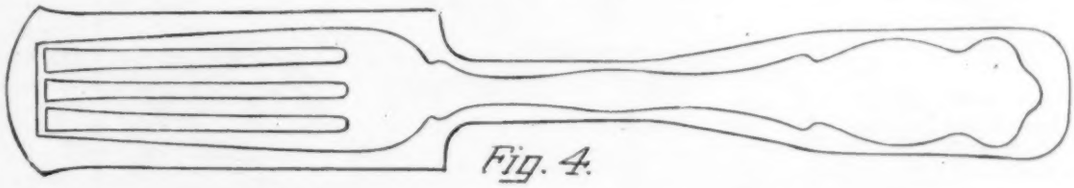


Fig. 4.

the final finishing, which is called "rough buffing," and makes a fine color. We must be careful to get the desired result without removing the silver. Plating requires the best materials and experienced platers. The work is wiped clean with chamois skin and after final inspection is papered, boxed and labeled to show the purchaser the quality of the goods he purchases.

The continued fine appearance and wearing quality depend to a large extent on how carefully every operation has been performed, from the base metal in the sheet ready to be cut into blanks until the last stage. There is an average of something like 60 separate operations on every piece of work made, not counting the transit of the work from one department to another. It is the mistaken opinion of some buyers that the metal is put into the hopper of some machine and comes out a finished article ready for use. Though the many improvements and changes of methods used at the present time over those of twenty-five years ago in the manufacture and plating of tableware suggest larger improvements in the future, we have not as yet reached that stage in the work whereby we can entirely lessen our efforts or vigilance and expect to produce silver-plated ware which will give satisfaction.

ROSE GILDING.

By Frederick J. Frost.

I have wondered what degree of success has been obtained by platers who have used copper in any form or quantity added to a gold solution, with a view of producing a rose gold finish, particularly if any excess of cyanide was present in the solution.

All formulas of rose gilding I have seen have given copper as an ingredient, either in the form of acetate or carbonate. Such an addition of copper could not be of any benefit and the solution would not deposit a rich yellow gold on the raised portions of the article.

For a rich rose gold finish, on gold goods, a newly made 24 karat gold solution, containing little or no excess of c. p. cyanide is necessary. This solution, to give a rich effect must be used hot with an electric current of two volts approximately. Cut five pennyweight of pure ribbon gold in small pieces, with shears, and place in a capsule or a non-metallic vessel capable of standing heat. Then cover it with 5 ounces of hydrochloric acid and 2½ ounces of nitric acid. Place over a slow fire. When thoroughly dissolved, add 7½ ounces of strong aqua ammonia, a few drops at a time. Allow the acid solution to cool before adding the ammonia. Wash this precipitate well with warm distilled water.

After well washing, dissolve this precipitate by adding a pint of water in which is dissolved ⅜ of an ounce of c. p. cyanide.

Previous cleansing of the article is, of course, the same as for any other kind of gold plating. Usually a scratch-brushing in a fairly strong solution of soap bark water, or beer and water is sufficient. The article is polished or sandblasted or satin finished with a steel wire brush previous to the cleansing process.

Use a platinum anode. This solution deposits rapidly. The dull finish it produces is removed from the raised part of the article, with powdered pumice, powdered alum or bicarbonate of soda. The plain places are usually relieved with a scratch-brush.

The article is again colored or flashed in a very weak gold solution, containing not more than one pennyweight to the gallon and having a slight excess of cyanide. This solution may be made by using 1 fluid ounce of the aforementioned solution to a pint of water, and at the same time add a piece of c. p. cyanide about the size of a pea.

In rose gilding silver belt buckles or other articles at a reasonable cost it is advisable to strike them in a silver solution. Then rinse in hot water before gilding. The gold solution may also be diluted by adding double the quantity of water. Otherwise the operation is the same.

For cheap brass work, it is advisable to acid dip them to produce the mat finish and then gild.

Various shades of color are chiefly obtained by varying the heat of the solution when in use, by rapid or slow motion of the work while gilding, quantity of electric current and in some cases by the addition of a few drops of silver solution, also the age of the solution. For some cases the coloring or finish solution should be dispensed with.

Practical experience is, of course, valuable in all work. Perhaps more so in work of this kind than in ordinary plating, but, I believe, the average plater can obtain good results by following these directions.

CARBON BISULPHIDE IN SILVER SOLUTIONS.

By Joseph Dimes.

All platers know that bisulphite of carbon will produce a bright plating, but quite a few are not familiar with its use. If added directly to a plating solution it will not mix or be taken up, but will settle as oil on the bottom. The proper way of adding it is as follows:

Take 1 pint of the regular silver solution and add 1 oz. of the carbon; place it in a bottle and shake well; then let it stand over night and filter, saving the clear liquid, which is used for addition to the solution.

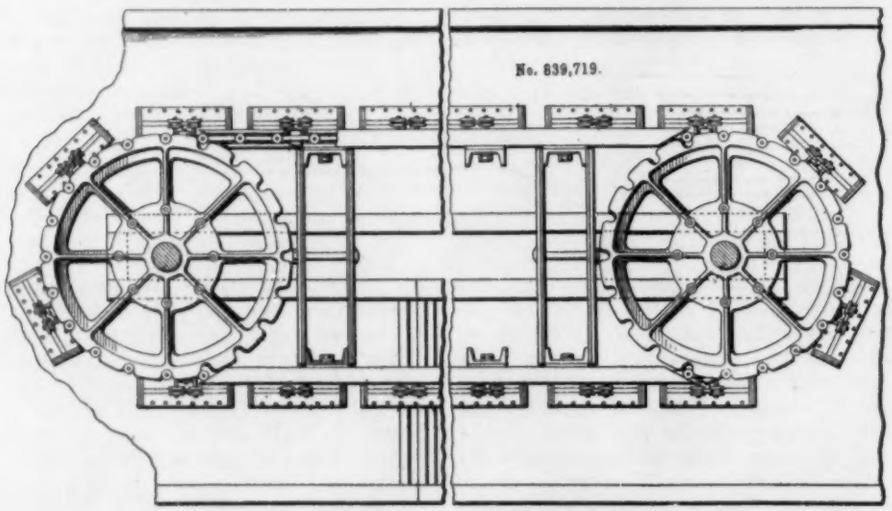
The mixture is used in this way: Add to your bright plating bath at night 1 oz. of bright mixture to each gallon of solution; stir well and allow it to stand until morning, when it will be ready for use. It is not advisable to add the bright mixture to any solution used for regular plating, but have a separate tank and solution for such work. The work will come out with a slight film over it, which will polish off and leave the metal clean and bright.

AUTOMATIC CONVEYING IN PLATING OPERATIONS.

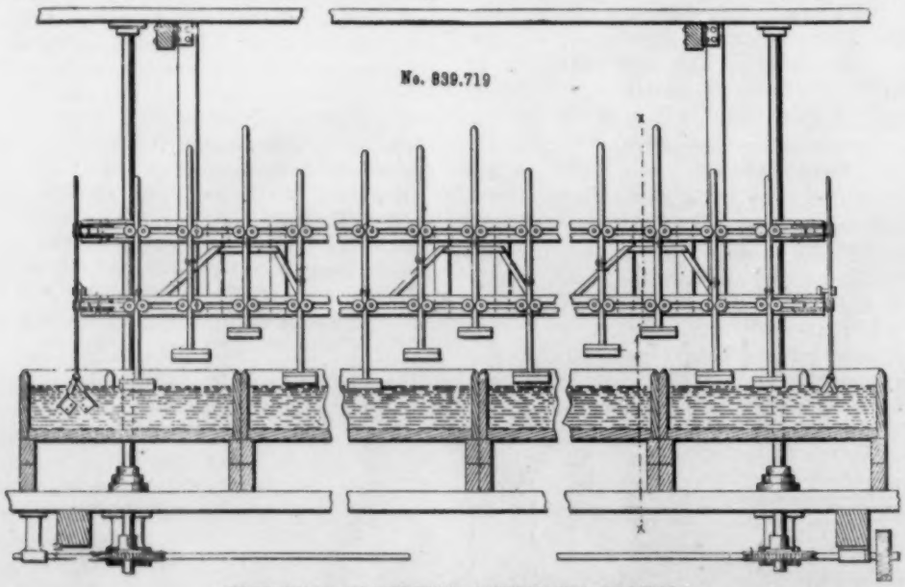
By W. L. Churchill.

(Concluded from January Issue.)

The strictly automatic devices are as varied as their requirements, from the continuous chain or belt with automatic clips that grip arc and dynamo carbons, carrying them through the various solutions necessary for coating them with their copper covering, to the more elaborate machines having auxiliary devices for lifting work from one solution to another, etc. It is in the solving of the problems of automatically transferring work from one solution to another that the engineer's skill is required. Where electrolytic cleaning is used it is essential that the work be promptly and thoroughly rinsed and submerged in the succeeding plating solution, and with alloy deposits the same condition exists in regard to removal from the plating to rinsing tank. Where the plating solution itself is of such a nature as to remove slight films of oxide, work can pass through the ordinary hot potash, rinsing and pickling solutions, on a continuous conveyor; which is also true in removing from nickel, copper or other single metal solutions, and where the work can be secured sufficiently to simply drag over a roller placed at the ends of the respective tanks. In such cases it is also common to convey the carrier under and over sprocket wheels to get the desired lifting and lowering motion without auxiliary devices, and still another method is to suspend the work from swiveled rods attached to an elevated conveyor, and to operate the rods by means of stationary guides, lifting the rods into a position parallel with the conveyor, at the required places, and allowing same to lower into natural position, when they have passed the necessary interval.



PLAN AUTOMATIC PLATER.



SECTIONAL ELEVATION AUTOMATIC PLATER.

One of the most successful types of these entirely automatic platers adapted to a large variety of conditions is one recently perfected and patented in which two endless sprocket chains are supported in a hori-

zontal position directly over the center of the series of tanks, dryers, etc., through or over which it is desired to pass the work. These chains run in channels and are provided with special links properly spaced and to whose outer surface are secured pairs of guide rollers, those on the upper chain being directly over the ones on the lower. Between the guide rollers thus placed, suitable rods arranged with racks or other attachments on lower ends to which to secure the work to be plated are passed, and while thus held in a vertical position, are allowed to be raised and lowered by means of rollers attached to inner surface of each rod, and which will roll along upper surface of the lower chain guiding channel and over stationary cams, placed in such positions as give the desired lifting and lowering action at the points required.

These plunger rods are arranged for electrical contact only at points desired, such as while passing over the plating or electrolytic cleaning solutions, and are provided with copper brushes for sliding contact, thus securing the same effect as by allowing slinging wires or hooks to rub along cathode rod. With the conditions of a single deposit of uniform character, and a sufficient quantity of work to justify its installation, this type of machine is most economical, as the only labor required is that necessary to attach the work to be cleaned and plated and possibly oxidized, and to detach same after it has passed through the numerous baths required and is dried.

Such mechanical platers not only save in labor but also in chemicals, as proper drainage and rinsing can be automatically secured, thus eliminating the pollution of plating and dipping solutions with acids, cyanides, etc., as are frequently carried from one solution to another by the too hasty or indifferent dipping and rinsing as done by hand.

From the foregoing brief descriptions it will be seen that there are few if any lines subject to plating operations that cannot be treated while in motion, and as the improvements obtained by this method become more generally known it will undoubtedly result in its more extensive and varied application.

LAKE COPPER VERSUS ELECTROLYTIC.

By Andrew M. Fairlie.*

II. PRINCIPAL SOURCES OF NORTH AMERICAN COPPER.

(*Continued from January Issue*).

From this cursory examination into the origin of copper, one fundamental reason for the existence of two varieties of the metal is plain. The earth holds, at accessible depths, two distinct classes of material for man to work upon: first, copper ores, or chemical combinations; second, rocks containing virgin copper, free and uncombined. This marked distinction, coupled with the fact that the ores of copper frequently carry notable values in gold and silver, whereas the native copper of Lake Superior contains no gold, and silver usually in small quantities only, has led to the development of two different processes for the extraction of the metal from the waste. These processes will be summarized in a later chapter. It may be remarked in passing that a step in the process of winning the metal from the ores is suggested by the name of one of the American grades of copper—"electrolytic." The name of the other variety—"lake"—signifies the geographical source whence it is derived, and leads now to the description of some of the principal copper producing regions of North America.

It has been hinted already that lake copper has its origin on the shores of Lake Superior—and indeed this is a thing of common knowledge enough. More specifically, the lake copper district is located in the State of Michigan on Keweenaw Peninsula, a tongue of land projecting from the south shore into the center of Lake Superior. The so-called peninsula, being cut off from the mainland by the Portage Lake and River, and the canal forming the western outlet to Lake Superior, is really an island. It is about 40 miles across, east to west, and extends northeastward into Lake Superior for about 70 miles. The "mineral range" of the region consists of a belt from four to six miles in width. Most of the producing mines are in the northern part of the peninsula, extending from the town of Hancock, on the Portage River, to a little beyond Calumet—about fifteen miles in all. South of Hancock, to a distance of about eight miles, another important group of mines is located. North of this continuous mining belt there is a group of unimportant mines, and in the Ontonagon country, farther south, are the Michigan, Mass., and Adventure mines, and a few others. In the entire district there are about forty mines. The most important are enumerated below, with the production in pounds avoirdupois for the year 1905.*

Mines.	Production.
Calumet and Hecla	95,100,610
Osceola	18,938,965
Quincy	18,827,557
Tamarack	15,824,008
Champion	15,707,426
Baltic	14,384,684
Trimountain	10,476,462

In the Lake Superior copper mines two products are distinguished: the valuable output called "copper rock," and the refuse or waste. In the copper rock the metal may exist as large masses, weighing sometimes scores and even hundreds of tons; or as smaller lumps known as barrel work, because it is packed and shipped in barrels; or finally as small, disseminated particles of copper in the "stamp rock." The prevalent idea that masses of copper are encountered too large to be removed to the surface at a profit is erroneous. The limit of weight for convenient handling is five or six tons; but larger pieces are cut with cope chisels into sizes suitable for hoisting. Mr. T. A. Ricard is authority for the statement that the chippings alone obtained in cutting a mass yield revenue enough to pay for the cost of the operation.

The copper discoveries in the Lake Superior copper district were the first to be worked on a large scale in the United States. The first copper mining was begun by the Pittsburg and Boston Mining Co., operating the Cliff mine, in 1846, and three years later this mine paid the first dividend in the history of the lake copper district.† By 1870, thirteen years before the discovery of the Butte camp in Montana, the famous Calumet and Hecla mines

*Chemist, Tennessee Copper Company, Copper Hill, Polk County, Tenn.

*Horace J. Stevens: The Copper Handbook, 1906, p. 1086.

†Horace J. Stevens: The Copper Handbook, 1902, p. 17.

were paying dividends, and since then the progress of copper production in the district has been steady.

Some have inferred, no doubt, from what has been said, that native copper is regularly mined nowhere in North America save on the upper peninsula of Michigan. This inference is correct, and the narrow geographical limits of the source of supply is another distinguishing feature of lake copper. Quite the contrary is the case with electrolytic copper. The ores of copper are found in at least forty States and Territories, besides Alaska, Canada and Mexico.

The most important ore-producing States and Territories are Montana, Arizona, Utah and California. In Montana the copper industry centers at Butte. Here are located the great Anaconda Copper Mining Co., Boston and Montana Consolidated Copper Mining Co., Parrot Silver and Copper Co., Washoe Copper Co., Butte and Boston Consolidated Mining Co., etc., all owned or controlled by the Amalgamated Copper Co. The Washoe plant of the Anaconda Copper Mining Co. is said to be the largest non-ferrous metallurgical plant in the world. An interesting book might be written on this smelter alone. Some idea of the enormous capacity of the plant may be formed from the following data for 1905.* The monthly pay roll was $215,000. The average number of men employed in all departments at Anaconda was 2,450. Statistics of daily operations are: ore treated, 7,000 tons; coal consumed, 600 tons; coke consumed, 400 tons; limerock used, 1,600 tons; flue dust produced, 190 tons; slag and tailings produced, 9,000 tons. The average monthly output in 1905 was: Copper, 15,000,000 pounds, value, $2,780,000; gold, $95,000; silver, $432,000; total, $3,307,000. The gigantic blast furnaces, three in number, and each 56 inches wide by 51 feet long, are a feature of peculiar interest at the Washoe plant.

The first copper made in Arizona was produced in an adobe furnace at Clifton in 1873. During the three succeeding decades the mineral resources of the Territory have received remarkable development. Since 1902 the production of copper has increased by leaps and bounds, until now the annual output of the Territory is second only to that of the Butte district. The annual copper production for a term of seven years is reported by Mr. Dwight E. Woodbridge† as follows:

Year.	Production, Lbs.
1900	105,640,000
1901	126,184,000
1902	119,841,000
1903	153,591,000
1904	191,602,958
1905	222,866,024
1906‡	300,000,000

The four most productive copper districts in Arizona, named in the order of their importance, are: 1. The Bisbee district, in Cochise County, near the Mexican border in the southeast; 2. The Clifton-Morenci deposits, in Graham County, also in the southeast, but farther north; 3. Jerome, on the Verde River, in the center of the Territory; 4. The Globe district, west of Clifton, in Pinal County. The estimated monthly output of the Bisbee district alone, including the plants of the Copper Queen Consolidated Mining Co. and of the Calumet and Arizona Mining Co. was, during 1906, 12,500,000 pounds. In the Clifton-Morenci district three companies have extensive interests: the Arizona Copper Co., Detroit Copper Mining Co. and the Shannon Copper Co. The United Verde Co. is the chief producer in the Jerome district, while at Globe three companies, the Old Dominion, United Globe and Arizona Commercial Copper Co. have, combined, a monthly output of 2,500,000 pounds. All of the important plants are undergoing expansion, and it has been predicted that within a few years Arizona will outstrip its only rival, the Butte district.

Utah ranks fourth among the copper-producing States and Territories of the country, or—excluding Michigan as a producer of native copper—third among the producers of copper ore. The region of greatest activity is in Salt Lake County, where the Utah and Bingham mines of the West Mountain district are located. The leading producers are about on a par, as is shown by the following figures, giving production in pounds for 1905: Utah Consolidated, 17,264,474; United States Mining Co., 15,841,667; Bingham Consolidated, 14,396,269.

Shasta County is the source of the principal production of copper in California. This State has come to the front since 1895. Statistics of her output do not show a steady growth, the production being given at 33,000,000 pounds in 1901, while in 1904 only 28,000,000 pounds are reported. The most important mine is owned by the Mountain Copper Co.

Mexico, as a part of North America, and as the second largest copper-producing country of the world, is entitled to consideration in this outline of the principal sources of North American copper. In Sonora the principal districts are La Cananea and Nacos. Lying just south of the Arizona boundary, these are practically a part of the Bisbee district, in Arizona. The property at La Cananea was owned by the Greene Consolidated Copper Co., a company recently absorbed by Butte interests. With a production in 1905 of 64,211,895 pounds, La Cananea ranks as one of the largest producers on the globe. The Boleo, in Lower California, is another large property, the production for 1905 being reported at 22,817,610 pounds. The plants of the American Smelting and Refining Co. at Aguascalientes, Monterey, and San Luis Potosi, swell the grand total of Mexico's output, which since 1902 has surpassed that of Spain, and has placed Mexico next to the United States in the production of the red metal.

(To be continued.)

*L. S. Austin: Washoe Plant of the Anaconda Copper Mining Co., Trans. A. I. M. E., July, 1906, pp. 532,533.

†*Engineering and Mining Journal*, May 12, 1906, p. 896.

‡Estimated.

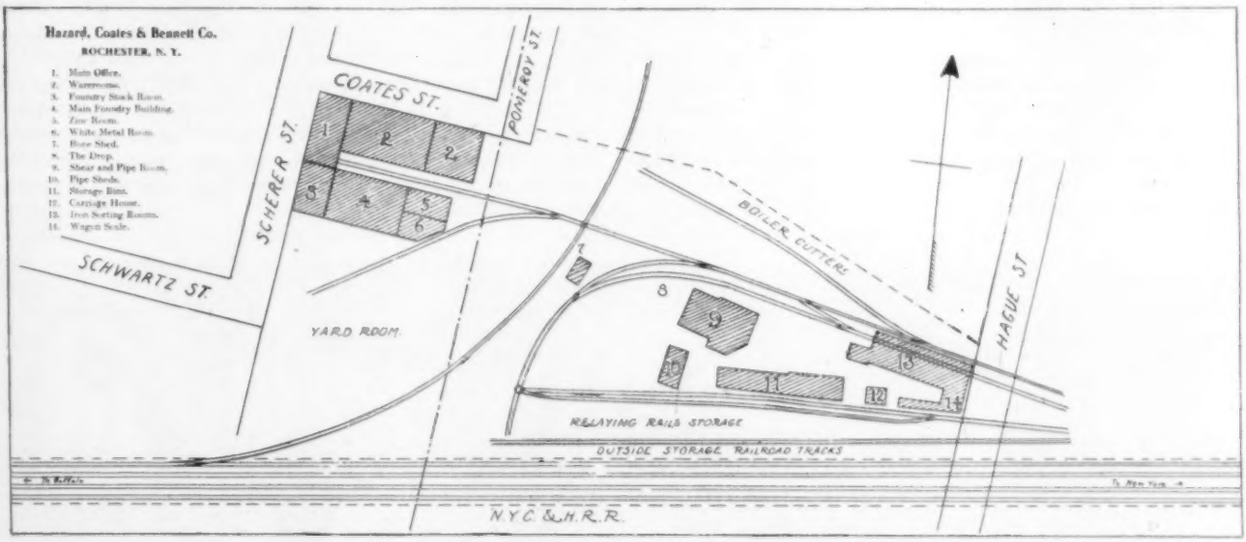
PLATED WARE IN BRAZIL.

Consul-General George E. Anderson, of Rio de Janerio, states that there is something of an opening in Brazil for the sale of American plated and hollow ware. The Brazilian people have taken to such goods, and the present trade would be far larger if it were not for the high tariff imposed. The imports last year amounted to about $150,000 worth of plated ware, of which Germany furnished about 50 per cent, France 25 per cent and the United States only 9 per cent. The Consul is of the opinion that this trade could be greatly extended as the people are very friendly to American products, but he states that American goods have not been pushed in that country, and that in consequence the trade has gone elsewhere. A trip to Brazil by a good salesman able to speak Portuguese and able to adapt himself to Brazilian conditions would result in much benefit to the trade.

During the year ending June 30, 1906, the United States imports amounted to $1,226,615,379 and the exports to $1,743,763,612.

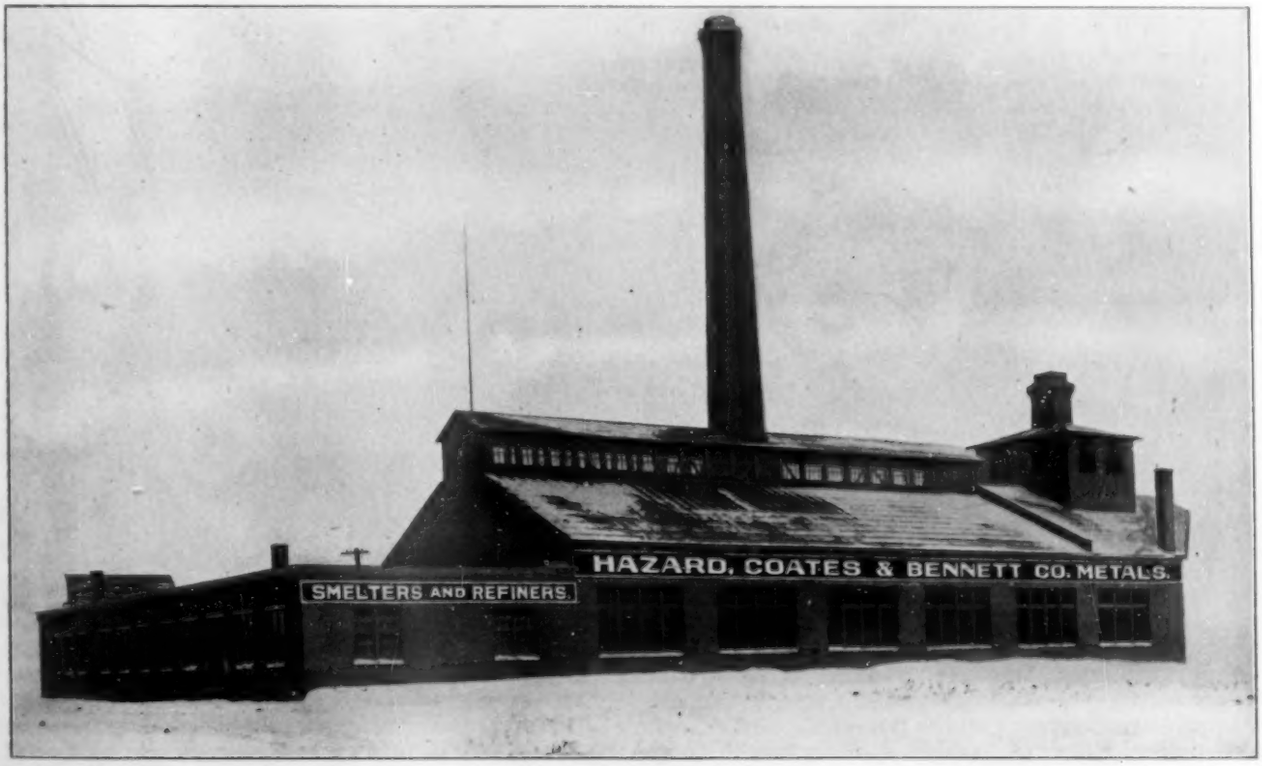
A MODEL SMELTING AND REFINING PLANT.

With the exception of a few large concerns the name of a smelting plant is associated with old tumble-down buildings, wornout equipment and a general makeshift appearance. The rule is that anything is good enough for the smelting and refining of metals. An exception to this is found in the new plant of Hazard, Coates & Bennett Company, Rochester, N. Y., which we herewith have the pleasure of illustrating and describing. The superintendent of this company, F. W. Reidenbach, has had a number of years' experience in the recovery of metals from scrap and residues and he determined that as soon as he obtained the capital he would build a smelting plant on the same plane as some of the modern brass works. That he has succeeded a visit to the works will prove, for, instead of the general disorder, will be found system and tidyness.



MAP SHOWING LOCATION OF PLANT.

An important feature is the situation of the works on the main line of the New York Central Railroad, with a switch running into the storehouse, with a platform on each side of the track by which the cars can be loaded and unloaded on both sides. The arrangement of the entire works is for the least amount of actual manual labor in the handling, sorting, smelting, melt-



VIEW OF THE PLANT.

ing and refining of the materials from the time they are received until they are shipped again in the form of ingot metals.

The system under which this plant is operated is similar to that of the great department stores. It comprises five departments, each operating in its own sphere.

Department "F," known as the foundry department, covers a space of 14,000 square feet and is equipped with every modern improvement, having in operation eight No. 200 special crucible furnaces, thus insuring the proper mixture of metals. It also has two large furnaces for reducing drosses and copper bearing material and cinder mills for grinding waste matter and by-products. The zinc room of the foundry department is also equipped with the latest improved devices for handling scrap zinc and has a production of 2,000,000 lbs. per annum. This room, being entirely separate from any other portion of the building, insures the guaranteeing of all other metals to be absolutely free and uncontaminated by zinc products or its oxides.

The lead and babbitt room, with a capacity of 2,000,000 lbs. of material per annum, is also equipped for the careful preparation of the various grades of material. It is the aim and object of the company to ascertain the wants of the buying public and supply them with their every requirement.

Department "W," known as the warehouse department, occupies a building 15,000 square feet on one floor, with railroad tracks directly into the warehouse, as will be seen by the outline cut, with a capacity of five to eight cars per day. This department is where all materials used by brass founders in scrap form are carefully sorted and carefully packed so that the purchasers may be assured of receiving exactly what their requirements call for.

RUNNING INGOT IN A MODERN SMELTING PLANT.

THE CARE OF CRUCIBLES.

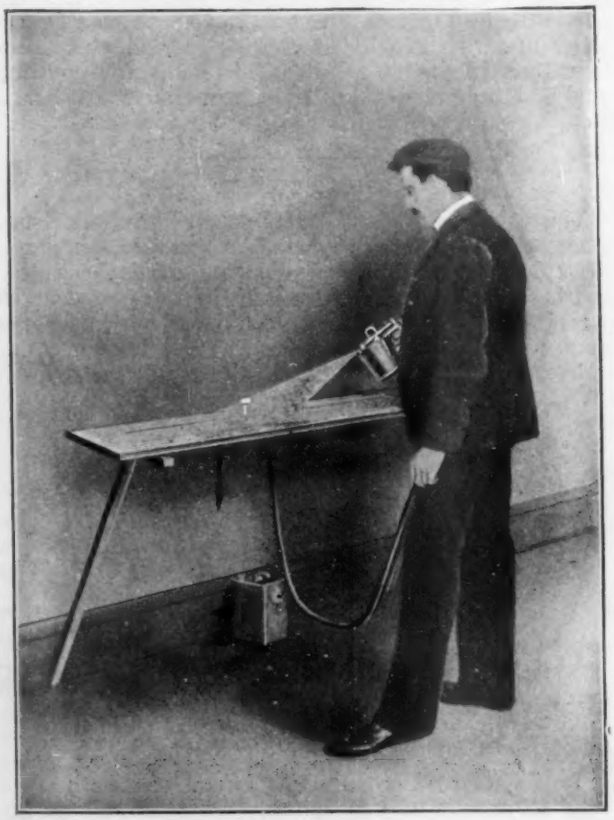
The proper care of crucibles when they are received at the foundry is quite an important matter, and considerable attention should be given to it. The moisture which enters the walls of the crucibles while they are in transit from the manufacturer to the consumer is a serious enemy and its effect should be counteracted by heating and annealing before the crucibles are used.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE PNEUMATIC SPRAYING OF PAINT, LACQUER, ENAMEL, ETC.

In our issue for November last attention was called to the benefits to be attained by the use of the pneumatic sprayer, or air brush, for applying all manner of paint, lacquer, japan, enamel, etc., which the Eureka Pneumatic Spray Company, 10-12 Chambers street, New York City, are developing for all classes of metal work in all manner of finishes. The company exercise great care and judgment in equipping each sprayer they send out with the most suitable nozzles for the particular kind of work for which it is intended. They



SPRAYING OF PAINT, LACQUER, ETC.

are able to prove many cases where they have made a saving for the manufacturer of from 50 to 90 per cent., seldom saving less than 25 per cent., and as a rule doing superior work with fewer coats of material; this is for the reason that the pneumatic process blows on the liquid perfectly smooth, sending it into the ornaments and corners and presenting a perfectly covered surface without streaks or blotches.

The company recently put in a plant in the works of The Tea Tray Company, of Newark, N. J., for finishing trays, electric reflectors, etc., in japan and enamel, and also for doing the lacquering. Formerly it required two coats of enamel when laid on with the brush, and two days were necessary to apply the same; now the machine is doing the work in a far superior manner with only one coat. The Dale Company, Hudson and Thirteenth streets, New York City, testify to the great saving and more perfect results obtained with this machine.

White or delicate colors can be applied direct on black iron without dragging the dirt from the iron and thereby soiling the first coat; therefore it is possible to finish this class of work with one coat also. The Sure Seal Company, of 24 West street, New York City, have stated that with one operator working three days per week they can turn out more work of a higher grade than they could before with five hand operators working six days a week.

Since the Eureka Company make three sizes they are enabled to adapt the machines to any requirements and to do almost every grade of work. The larger sizes are very popular with structural iron workers, and are used on railroad cars and where other large surfaces are to be covered.

An important feature of the machine is found in the fact that the heaviest pigments or bronze are stirred perfectly while using. The top may be removed in an instant for filling or cleaning, and without undoing a union. The sprayers are made entirely of brass, with a seamless reservoir, and are free from packing or washers. Manufacturers of electrical goods and machinery have found them valuable for painting and japaning and for finishing switchboards. This concern will very shortly place on the market their new "Record" air brush for delicate finishing and blending on art metal work and novelties.

VITRIFIED CLAY PRODUCTS.

The Laclede Fire Brick Manufacturing Company, of St. Louis, Mo., was established in 1844 and incorporated under the laws of Missouri in 1869. The capital now is $1,500,000, fully paid. The company now have a factory especially designed for the manufacture of gas retorts, of size sufficient to handle 3,000 retorts at one time. They also have an entirely new plant for the manufacture of chemical brick, fluted rings, lining blocks for acid towers, etc. They have recently installed an additional dryer which will increase their capacity over 100,000 brick per day. This company is the only one in this line of business having a complete laboratory in charge of an experienced chemist, whose duty it is to investigate the troubles which users of fire brick experience and to rectify their difficulties by working out mixtures of fire clay which will meet the conditions encountered.

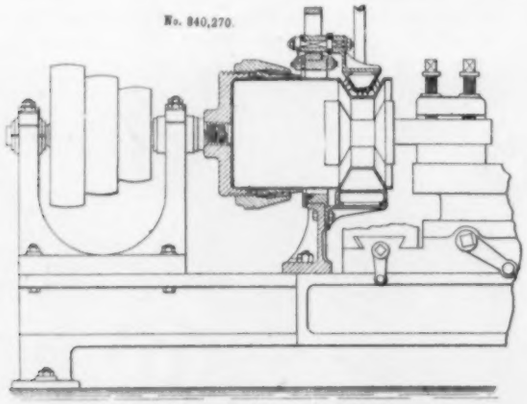
METALLIC MANGANESE.

George G. Blackwell, Sons & Co., of Liverpool, England, announce that after experimenting for about two years they have succeeded in producing a high percentage metallic manganese and are in a position to offer this metal at lower prices than the manganese metal which is at present sold by the alumino-reduction process. Metallic manganese is being used more extensively in alloying the non-ferrous metals. Among some of the manganese alloys on the market are manganese copper, manganese zinc and manganese bronze.

HEATING DEVICE FOR SPINNING LATHES.

Letters patent issued to Rudolf Thiel, of Lubeck, Germany, describe improvements in heating devices for spinning lathes whereby it is rendered possible to maintain the heating device at a proper and uniform distance from the blank while the latter is being spun. Whether there be an increase or decrease in the diameter of the article it is at all times heated up to the right temperature and cannot become brittle and cracked.

The bed of the lathe carries an annular plate which surrounds the blank. A number of hollow and perforated heaters are provided, some of which are secured

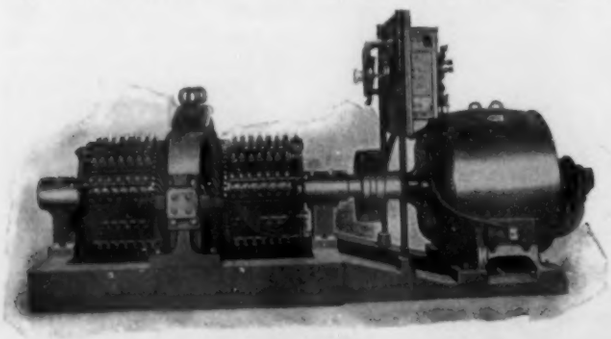


HEATING DEVICE FOR SPINNING LATHES.

to the plate, while the others, alternating with the first, are radially guided in the plate. The movable heaters can be shifted on the plate so as to maintain the proper distance between them and the blank. All the heaters are detachable and may be replaced by others in accordance with the required shape of the article. If the distance between the stationary heaters and the blank becomes too great for the gas flame to properly heat the metal then the supply of gas to the stationary heaters may be stopped and only that to the movable heaters maintained. The metal of the article is thus kept at the right temperature, so that it cannot become brittle and crack. The annular plate has an opening of such size that it can be at once removed after the completion of the article.

LOW VOLTAGE GENERATORS WITH CARBON BRUSHES.

It has been the aim of nearly all manufacturers of low voltage generators to so design their apparatus that carbon brushes could be used instead of the cop-



LOW VOLTAGE GENERATOR.

per gauze or leaf brushes, but the difficulties have been many. The Chas. J. Bogue Electric Company, of 213-215 Centre street, New York City, have recently brought out a new generator using carbon brushes which proved very satisfactory. They have had a generator of this type in service for the past few months at the Philadelphia mint. This machine has a rating of 1,500 amperes at 15 volts and is of the direct connected type as shown in the cut. A motor of the Western Electric Company is connected to the generator by means of a flexible and insulated coupling, the motor and generator being on one common bedplate. This machine has its fields wound for separate excitation from the motor circuit and had a rheostat in circuit to allow of voltage adjustment of the generator. A switchboard is mounted on uprights with motor switch, starting box and field rheostat all mounted on the same, making a self-contained set.

While this generator has many features of merit that recommend it to the user, the special feature is the use of carbon brushes. On a test of this machine after a 10-hour run at full load, the rise over the surrounding temperature at the armature was 34.4, at the field 33.8, and at the commutator where the heat is expected to be the greatest, was 23.3 C. These figures show that the machine is capable of a much greater load than it was tested at. This set is run continuously night and day until the work on the order is stopped—a period of from one to four weeks.

SPIRAL TUBING.

This tubing, for which letters patent have been issued (December 25, 1906) to Edwin T. Greenfield, of Kiamesha, N. Y., is sufficiently flexible for practical purposes and has strength enough to permit its being used under pressure. The two strips of which the tube is formed are wound into two series of relatively movable spirals, one series being inside the other. With each of the strips is

No. 838,331.

SPIRAL TUBING.

combined a reinforcing strip and in addition means for determining the maximum permissible movement of one spiral relatively to the spirals adjacent to it. Upon any movement of the spirals within the limit so determined—as, for instance, when the tubing is bent at a sharp angle—the movement of two spirals (for example) of the outer series away from each other uncovers a portion of a spiral of the inner series at the point; however, where the same is protected by the reinforcing strip, such point therefore presents a double thickness of the material used.

The Treasal Bronzing and Plating Company, 245-247 West Twenty-eighth street, New York City, have just completed work on the Erie terminal on West Twenty-third street, New York City, using the same material as was used on the Delaware, Lackawanna & Western ferry-house. It was not a verde antique lacquer of any description, but an acid solution. There was no lacquer, wax or oil used on the work. The same firm are also doing a large eight-story building on West Forty-ninth street in verde antique, with statuary bronze effect on the plain parts.

CARBON TETRACHLORIDE.

Carbon tetrachloride is a heavy, colorless, transparent, mobile liquid having a neutral reaction. It is absolutely non-inflammable and non-explosive; even its vapor does not take fire, and it acts as a fire extinguisher. It is insoluble in water, diluted alcohol, and glycerine, and is freely soluble in acetic acid, liquid carbonic acid, ethyl and amylic alcohol, ether, oil of turpentine and petroleum and all petroleum products.

Its most useful property is its great solvent power, carbon tetrachloride being one of the greatest solvents known. It dissolves oils, fats, resins, wax, guttapercha, paraffine, varnish, paints, asphaltum pitch, coal tar, indiarubber, and also soda and potash soap. Further, it dissolves salicylic acid, carbolic acid, iodine, bromide, camphor, napthalene, etc. It is not acted upon by strong mineral acids, and is not decomposed by an aqueous solution of potassia. Carbon tetrachloride is strongly recommended as an extracting medium. It is different from benzine, gasoline, etc., in that it is a chemical unit and in its recovery from the extracted fats, grease, etc., it is always obtained as the same chemical combination, with the self same properties; whereas in benzine or gasoline there are unavoidable losses to be sustained, particularly in the valuable, very volatile parts. Oils and fats extracted with it are obtained in the highest degree of purity, absorbing none of the extracting medium whatever, not even the odor. Another property of tetrachloride is that it does not in the least affect the colors of fabrics. The most delicate colors, even aniline colors of silk, satin, laces etc., are not affected in the slightest degree.

Carbon tetrachloride is manufactured by the Acker Process Company, of Niagara Falls, N. Y.

DROP HAMMER EFFECTS.

The Miner & Peck Manufacturing Company of New Haven, Conn., have published a card giving in convenient form the relative effects produced by hammers of drops falling from different heights. The table shows the economy of using heavy hammer with short lift. This is illustrated in the following way: "If you are operating hammer of, say, 100 lbs. in weight, at a certain height, by using hammer of 400 lbs., at same height, you will obtain a result four times as great with an expenditure of four times the horsepower; while if you raise your 100-lb. hammer four times as high you will obtain but twice the result, although you will expend four times the horsepower in doing so." The table shows the time occupied, the velocity, and the dynamic effect (expressed in pounds of static pressure) produced by a solid body weighing one pound falling freely from rest by the force of gravity.

BASKET ANODES.

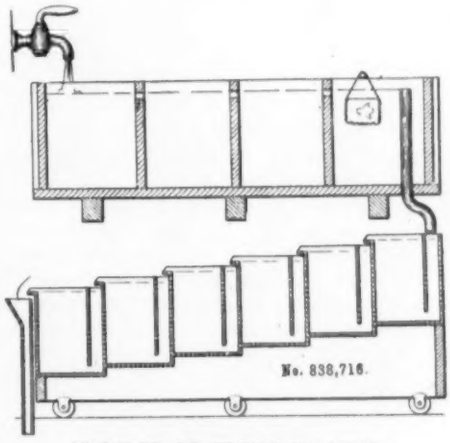
The object of basket anodes is to be able to use the metal in its cheapest form and to have no waste. It is well known that from 25 to 50 per cent. of the anodes used in nickel plating are wasted by the common method. Part of this waste is found in the form of a precipitate at the bottom of the tank; another part is removed with the carbon that is left on the surface of the anode after same has been eaten away, and the balance is sold as scrap at about half the price of new anodes. These objections are all done away with when the basket method is used. With the basket anode grain nickel or scrap may be used. If grain nickel is used there is no waste as nickel in this form has no carbon or other impurity. If scrap nickel is used there is, of course, the usual waste in the form of precipitate and carbon, but as the first cost is only about one-half this represents a large saving.

These anodes, which are made by the American Nickeloid & Manufacturing Company, of Peru, Ill., are practically indestructible and the first cost is very reasonable.

PROCESS OF ELECTROPLATING.

In gold plating the articles which are plated carry with them, when removed from the bath, a considerable quantity of the plating solution. It is essential to the appearance and quality of the plated articles that this solution should be thoroughly rinsed from them, and for this reason it has been the practice to immerse them in an abundant stream of water, which removes the adhering solution. This practice involves two elements of waste: First, the solution itself, which was originally rich in precious metal, is carried away in such a dilute condition that it is practically impossible to recover it, and second, the establishment where the plating is carried on uses an unreasonably large quantity of water which must be paid for.

William S. Hutchinson, of Boston, Mass., has patented a device (December 18, 1906) which is intended to overcome these objections. This invention provides a rinsing tank formed with a number of compartments which communicate one with the other through openings at the tops of the partitions. Water is let into one of the end compartments. From the last compartment the water flows to a series of zinc boxes. In the device as shown the articles are first immersed in the second tank from the outlet end and then in the next to the left and so on. By this means the water in the first tank entered contains a more concentrated solution of the plating fluid than the others, and the articles in their passage through the compartments carry a smaller and smaller amount of the solution. It has been found in practice that articles can be rinsed by this method with a very small amount of water. The zinc recovering boxes are filled with zinc shavings through which the rinse water passes. The valuable metal deposited by reaction upon these shavings is afterward recovered.



PROCESS OF ELECTROPLATING.

As we go to press with this issue we have received from the Joseph Dixon Crucible Company, of Jersey City, N. J., a very beautifully gotten up book dealing with "Crucibles, Their Care and Use." The subject matter is of the greatest interest to those having to do with the melting of metals. We hope to present a more extended notice of this work in our next issue.

EDITORIAL

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THE METAL INDUSTRY
The Consolidation of
THE ALUMINUM WORLD
THE BRASS FOUNDER and FINISHER
AND
ELECTRO PLATERS REVIEW

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CONTENTS.

THE HEALTH OF BUFFERS AND POLISHERS.

An article contributed to the *Independent* by Andrew Hellthaler considers in the severest manner the conditions under which buffers and polishers have to work. The writer is organizer and business agent of the Metal Polishers', Buffers', Platers', Brass Molders' and Brass and Silver Workers' Union of North America, and in addition is entitled to a hearing by reason of the fact that he worked as a silver polisher for fifteen years in New York; he therefore deals with a subject with all the features of which he is familiar from his own experience. It is shown by the death claims paid by the organization from 1903 to 1906, inclusive, that of the total deaths of 205, 148 were metal polishers who died of tuberculosis. This means that 75 per cent. of the deaths occurred among those carrying on plating operations. Apart from tuberculosis, deaths among polishers were due principally to suicide or accident; from this the conclusion is drawn that the work will eventually kill the man if he sticks to it long enough. Polishers are notoriously short lived and when we consider the atmosphere they are compelled to work in the only surprise is that the average life is as long as it is. Working in air laden with lint, emery, grease and metal particles, according to the character of the work done, is certainly not conducive to longevity.

But the writer advances no remedy for the trouble. Pointing out a defect may yield good results, but calling attention to a defect and then providing means for its abeyance is incalculably more valuable. Grinding operations connected with the precious metals, is widely different from those with the base metals because of the necessity of preventing loss of the metals themselves; in the first instance the mere getting rid of the impurities will not answer; the impurities must be removed so as to be harmless and at the same time they must be recovered. The ordinary methods of removing dirt and grit from grinding operations are failures when applied to the polishing of gold and silver, copper and brass. Exhaust systems arranged over each wheel have been found efficacious in dry grinding work, since the particles of metal and abrasive can be carried away with the air current; they are comparatively light and clean. But the problem confronting the polisher of the precious metals, and copper and copper alloys, is of an entirely different nature and demands treatment specially adapted to its own characteristics. To collect and remove a dry material so fine that it practically floats in the air is a simple task that is being accomplished successfully in hundreds of establishments. But the trouble is greatly complicated when each of these minute particles is coated with a sticky grease. The problem would be a long way toward solution if the polishing and buffing operations could be carried on perfectly dry. It is con-

ceded that the greatest obstacle comes from the use of paraffine as a binder for the tripoli, rouge, flour emery and the like on buffs. This coats the lint, abrasice and metal and furnishes the stickyness which makes it cling to everything in the polishing room. Since the present methods seemingly make its employment necessary, the remedy must be sought in other directions.

Mechanical polishing has been tried, but except on large, duplicate work of the simplest shape, has not proved successful. Polishing irregular shapes must be performed by manual labor; no machine has yet been devised which will take the place of the man.

The usual provisions for the removal of dirt are inoperative for the reasons stated in an article on "Dust from Buff Wheels" in our issue of last August. A buff wheel revolving at high speed constantly bombards the operator with particles from the wheel and from the work; and the air thus laden he is compelled to breathe. The main objection to the exhaust method of disposing of the dirt is that the pipes and fans soon become clogged with this material and are thereby rendered useless. It has been further claimed that fire risk is augmented by these accumulations. But we are of the opinion that both these criticisms are groundless in the extreme. The pipes used in this system are large and the fans are usually placed so as to be easy of access. Cleaning both the pipes and fans is not, therefore, a difficult job, neither is it expensive; once adopted and the objections to the exhaust method are removed. An exhaust system will not work to advantage without some attention and it is hard to understand why this particular industry should so object to medium cleanliness in its surroundings.

THE PRICE OF BRASS CASTINGS

A short time ago we received the following inquiry from a correspondent in San Francisco: "Being away out in the Far West and with the rapid advancement of prices of copper and tin, we are now closely connected with the ruling prices of the East. From THE METAL INDUSTRY we obtain the selling price on all metals pertaining to the brass business; but we would like to know the ruling prices of brass castings, such as yellow brass, red brass, phosphor bronze, and also the price on car brasses both solid and babbitted.

"We ask these questions as our customers say that they can get the various castings cheaper East than we can produce them here at the ruling prices. Of course we are only what you might call a jobbing shop and manufacture on a small scale."

As a first step we promptly asked our friend in the Far West for his own prices and received the following:

Yellow brass	$.25
Red brass	.28
Phosphor bronze	.38
Car brasses, solid and babbitted	.18

These were stated to be the ruling prices in San Francisco.

From Philadelphia we learn that the ruling price for car bearings varies from 20 to 25 cents per pound, according to quality, both solid and babbitted. The babbitted bearings usually sell for about 1 cent per pound cheaper than the solid ones.

From one concern in Massachusetts we are informed that they only make a few castings for local parties and they charge 50 cents a pound, no matter whether made of yellow, red or phosphor bronze.

A Jersey City establishment has the following schedule of prices:

Yellow brass	$.27
Red brass	.28
Phosphor bronze	.29
Car brass, solid and lead lined	.27

A Chicago firm of brass founders inform us that the price of castings is based on the condition of the patterns and also on the weight of the castings. For the average size of brass castings, in yellow, they usually get from 28 to 30 cents; red brass is about 32 cents.

We have obtained more complete and definite information from a large firm in St. Louis, Mo. Their ruling prices on castings and journal bearings on to-day's (January 4) markets are about as follows:

Yellow brass	$.27
Red brass	.30
Phosphor bronze	.32
Gun metal	.31
Solid lead lined journal bearings	.26
Babbitt journal bearings	.23

In Cleveland, O., the prices per pound on castings of medium weight are about as follows:

Yellow brass	$.25
Red brass	.28
Phosphor bronze	.31

We quote the following from a well-known firm of brass founders and manufacturers of Rochester, N. Y.:

"Replying to your letter would say that just at present time prices are in a very unsettled condition on brass castings, or anything containing copper. We can, however, give you a rough idea of prices and would say that yellow brass castings are selling for 30 cents per pound and up; red brass castings for 32 cents per pound and up, and phosphor bronze for 35 cents per pound and up. Railroad brasses, leaded, of course, sell at quite a variety of prices, according to the metal they are made of. A good bearing can be produced and sold for 32 cents. We are not familiar with brasses that are put out without lead or babbitt linings and cannot give you very much information."

A summary of the above shows that yellow brass is cheapest in San Francisco and Cleveland, being 25 cents. In St. Louis and Jersey City it is 27 cents, and in Rochester and Chicago 28 to 30 cents.

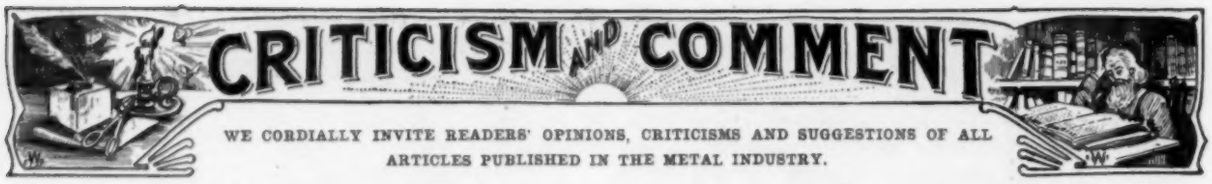
Red brass is 28 cents in Jersey City, San Francisco and Cleveland, and 30 and 32 in St. Louis, Rochester and Chicago.

Phosphor bronze is 29 cents in Jersey City, 31 cents in Cleveland, 32 cents in St. Louis, 35 cents in Rochester and 38 cents in San Francisco.

From the above it will be seen that our friends in San Francisco are below the East and Middle West in the case of yellow brass; even or below the prices for red brass; and higher than any of the others in the case of phosphor bronze.

ROLLING MILLS OVERCROWDED.

Sellers of sheet, rod, wire and tubing announce that the brass and copper rolling mills are overcrowded with orders and that consumers expecting to order this material should place their contracts in advance of the date of requirement. The manufacturers now have enough orders in hand to keep them going day and night for at least two months. The scarcity of copper ingot makes the future deliveries of brass and copper products somewhat uncertain.



PREVENTING WAX FROM SHRINKING.

To the Editor of THE METAL INDUSTRY:

In wax pattern making there are two different kinds of wax in use; one is ozocerite. This is a mineral wax and is the product of paraffine oil (petroleum). It is composed mainly of paraffine (white wax), which shrinks a great deal and is also hard to work, being brittle unless a small quantity of Venice turpentine is added, which will also prevent shrinking to some extent. When mounting the work the joints have to be melted together with a hot iron to make them stick together, as this wax cannot be worked easily or modelled.

The other wax used quite extensively is beeswax. On account of its high price it is often adulterated with the cheaper wax, paraffine—in fact, in some grades there is more paraffine than beeswax. This makes a troublesome shrinking. In addition this wax is usually accompanied with a lot of impurities such as dead bees to make it look genuine. It is advisable to boil it at a low heat—in a water bath preferably—for two or three days to expel all moisture and volatile matter; this will reduce some of the shrinking tendency.

To cast wax in plaster molds in cold weather the mold should be laid in warm water until it will absorb no more. The heat thus imparted to the mold will keep the wax from shrinking while cooling. Soaking the mold in warm water can also be practiced with ozocerite with good effect to prevent shrinking.

Now a word to the readers who have never cast with beeswax. They must not think that the wax is used without other ingredients, as about two parts of common resin is mixed with it while melting. If much more than two parts is used the wax requires such a heat to run well that there is danger of burning the mold; in other words, it will expel the water from the fine projecting portions and stick there.

When casting have as large a gate as possible so as to receive a large flow, not a small stream, as the wax would cool off as fast as it goes in and the result would be a poor and wrinkled casting. The wax must be cool enough for the finger to bear the heat when held in it before casting. The hotter the wax gets the more it expands and therefore the more it will shrink.

Corona, N. Y. D. J. LEMAL.

ACID GREEN FINISH ON COPPER AND BRASS.

To the Editor of THE METAL INDUSTRY:

The formulas given in THE METAL INDUSTRY for the production of the verde antique finish, both in the acid and pigment method, are being used very successfully. In the production of the acid greens it is necessary to stipple the articles soon after immersion with a good painter's sash tool. This gives the variegated effect after drying; the lacquering and waxing bring out the true effect. We give you these additional formulas, both of which are being used by producers of artistic metal goods. For articles of sheet or cast brass:

Sulphate of copper	½ lb.
Chloride of ammonia	½ "
Water	1 gal.

Use the solution warm. Immerse the articles for a few seconds and allow to dry somewhat and then stipple with the following solution: Dissolve 1 oz. carbonate of copper in 3 oz. 26% water ammonia, then add 24 oz. water. Lacquer and wax. For the other formula prepare a solution of

Chloride of zinc	¼ lb.
Sal ammoniac	2 oz.
Sulphate of copper	½ "
Glycerine	½ "
Water	1 gal.

Mix well and add ammonia water slowly until a slight precipitate of zinc is noted; do not add more. Copper and oxidize the articles and immerse after washing in the above solution. Remove and drain without washing. A greenish stain will appear. For the dark verde stipple this deposit as mentioned before and the green will appear. After drying, lacquering and waxing the beautiful dark finish will be produced.

Arlington, N. J. C. H. PROCTOR.

NEW BOOKS

Practical Lettering. By Thomas F. Meinhardt. Norman W. Henley Publishing Company, publishers, New York City. Price 60 cents.

This is a practical work for the beginner, draftsman, engineer, sign painter, engraver, etc., and provides a rapid and accurate method of becoming a good letterer with a little practice. It is very evident that without an accurate system of spacing there can be no perfect results in lettering. The author furnishes a systematic method of spacing and the plain and invariable principles governing the variations in space are taught in clear and comprehensive language. The application of this system will result in training the eye until the letters will be grouped correctly by force of habit. There is a scale of 16 units, which is original with the author, and this scale divides the letter into four quarters with a center guide line, and defines the optical proportions of a letter in a most practical way. The preface states that "The unique and principal feature is the facility to determine the exact length of an inscription and the height of the letter best suited to cover the room at command, before the work is started." By this means the letterer knows the exact spot where the first letter should start and the last letter end, with even margins front and rear. Unnecessary sketching is thus avoided. Two plates are devoted to styles; by practice in any special calling any additional knowledge can be acquired.

A German inventor has been allowed a patent on an apparatus by means of which the work of bronze-powder oxidation is done for the most part mechanically. It is designed to relieve the workman from the unpleasant and rather dangerous labor of stirring the powder by hand during its heating. The mixer is arranged so that it can be turned aside from the source of heat when the proper degree of oxidation is reached, and at the same time its rotation is stopped, in order to facilitate emptying and refilling.

CORRESPONDENCE

IN THIS DEPARTMENT WE WILL ANSWER ANY QUESTION RELATING TO THE NON-FERROUS METALS AND ALLOYS. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

METALLURGICAL.

Q.—We are making some experiments to determine the loss of composition metal in melting and would be pleased to know if you have any data showing what the percentage of loss is on the following mixture, which is equal in color to a mixture of 60% copper and 40% spelter, but is made from old metals proportioned as follows:

Ingot brass (analysis supposedly 35% spelter, 65% copper)	300 lbs.
Brass gates	300 "
Lead	6 "
Spelter	30 "

when melted in a Swartz furnace, also in crucibles.

A.—A large manufacturing concern that operates both crucible and Schwartz furnaces reports the loss in melting heats composed exclusively of rather light sheet and punching yellow brass to be 3 4/10 in the crucible and 2 8-10 per cent in the Schwartz furnace.

Q.—We are having considerable trouble occasionally with our bronze castings in that they are porous, and these spots look to us as though there was some iron in them. Sometimes we get mighty good castings, and at other times have this trouble. We use a good deal of red scrap, together with pig tin and phosphor tin. Can you give us the remedy?

A.—The trouble is probably due to the miscellaneous character of the red scrap. Remelting it and using the resulting red ingot in your mixtures would probably rectify the trouble.

Q.—Let me know the composition of plastic metal used for the bearings of machines running at high speeds.

A.—The so-called plastic metal is said to be made up as follows:

Copper	64.5
Lead	29.5
Tin	4.5
Nickel	1.5

The nickel and copper may be melted together and the lead and tin added. The metal is poured into ingots and remelted for casting.

Q.—I send samples of a metal I would like to make; kindly tell me how to do it.

A.—In mixing lead bronzes, in order to make the copper and lead go together they must both be very hot and well protected from the air. As it is a very difficult matter to get a perfect mixture it might pay you to get your metal from the producers of the alloys and make your castings from it.

Q.—We are sometimes troubled with the burnt sand inside cored castings. If we knew of some good way to get the sand out we could use the castings instead of remelting them. Is there any way of taking this sand out?

A.—Burnt sand inside cored castings is best prevented by making the cores of a core sand high in silica and washing them with silver lead of the best obtainable quality. The burnt sand is best removed by the sand blast.

Q.—We find difficulty in getting a nice, soft, soluble anode for cyanide copper solution.

A.—Cast anodes give the best results in cyanide solutions of copper or bronze owing to their softness and more granular structure than rolled metals. Make a wood pattern of the size and shape of the anode you want and mold it in coarse sand. For copper, use lake copper only; for bronze, 83 parts copper and 17 parts bertha spelter; for brass, 66 parts copper and 34 parts bertha spelter.

Q.—Let me know what you consider the strongest and best metal for gears and motor pinions. We want the toughest and strongest that can be made, regardless of cost.

A.—The best and strongest metal for gears and pinions is phosphor bronze, consisting of

Copper	92 parts.
Tin	7½ parts.
Phosphorus	½ part.

It should be poured into ingots and remelted. If more tin or phosphorus are used the bronze will be harder, but it will be difficult to machine the castings without chattering.

Q.—Under separate cover we send you specimen casting which shows spongy when turned. These castings are made up of 62% copper, 3% tin, 33% spelter and 2% lead, with 2 ounces of aluminum to each 150 pounds of metal. We are at a loss to understand this spongy condition. The part that is machined is made in the drag and not in the cope; this perplexes us all the more, as usually defective castings of this character show their defects in the portions molded in the cope.

A.—Aluminum should never be added to mixtures that are to be used in making castings that must stand heavy air or water pressure. It becomes oxidized and the molten metal is not readily freed from the oxide, as it does not easily rise to the surface so it can be skimmed off. If you use an oil melting furnace try poling your metal with a green hickory pole and leave out the aluminum. If you must use aluminum in order to run very light castings, put it into the bottom of the crucible with a pair of pongs so that it will not oxidize. Mix at least two-thirds new metal with your remelt.

Q.—I have several valuable clippings from your paper. I would like you to let me know the method or methods for obtaining the percentage of metal contained in various drosses. And if possible how to determine the kind of metal that one may have.

A.—The methods for finding the percentage of metals in various drosses may be found in the text-books on quantitive analysis. To carry out these methods requires an analytical balance and some skill in manipulation. A person who is not a trained analyst would find such work very difficult, but if he

had a balance and books of methods—and plenty of grit—he might succeed.

Q.—Please give me the composition of a first-class manganese bronze for making automobile parts that have to stand a heavy strain.

A.—Manganese bronze may be poured directly from the first melting, but this is only done by a few firms that have had a long experience with it. It is a very difficult metal to mix properly and it would be best for you to buy your ingot from a reliable maker and follow his instructions for handling it strictly in every respect.

PLATING AND FINISHING.

Q.—We are having quite a little trouble matching Winslow bronze. We send you a sample and would like to know how to get that shade.

A.—The sample bronze finish you refer to as Winslow bronze can be very easily produced as follows: Dissolve 2 ounces sulphuret of potassium and ½ ounce water ammonia in 10 gallons of water; use nearly cold. The sample piece of tube was not polished but finished in the rough. If your work is of this nature proceed as follows: Clean the articles in the usual way, scratch brush, wash and immerse in the solution mentioned for a few seconds; remove, wash, dry, and brush lightly. If the color is deep enough brown immerse very quickly a second time and dry out. Do not brush a second time. Then lacquer with a transparent dip lacquer. Your sample was refinished by us in this manner.

Q.—Can you give me any information in regard to enameling small articles by the tumbling process, as these articles have to be handled in large quantities?

A.—The sample submitted is coated with a dead black air drying japan. The method used is the usual tumbling barrel one. The articles are placed in the barrel and a small quantity of the prepared japan is sprinkled over them and the tumbling gone on with. The sprinkling is done frequently; when a sufficient coat has been applied the articles are removed and allowed to dry in the air. With a baking japan the same plan is followed, but the work is dried with heat.

Q.—Our silver solution, when enough anode surface is used to equal the work being plated, burns very quickly. We use two volts for plating. We might also mention that the anodes turn black. Kindly advise us.

A.—We are of the opinion that your solution does not contain sufficient silver in proportion to the amount of free cyanide you carry. Black anodes sometimes result from impure silver and any amount of free cyanide will not keep them clean while the plating operation is going on. Black anodes also result when the solution is low in metal. A little ammonia water added occasionally will correct the improper working of the bath, sometimes even when the solution has a tendency to produce a coarse grained deposit.

Q.—In nickel plating articles which are soldered it is necessary to remove all the grease and dirt without the use of potash, because the action of the potash on the solder puts a coating on the article which will not be removed by cyanide and which cannot be plated properly. We would like a chemical that will do this cleaning.

A.—Your trouble is caused by an oxide of tin that forms upon the articles. Cyanide will not remove this oxide, but a 3 to 5 per cent solution of hydrochloric acid will remove it almost instantly and without affecting the polished surface. We would advise you to clean your articles with a platers' compound solution. This is kept in operation same as a potash solution, but should be maintained at the boiling point continually. This solution is prepared by dissolving ½ pound of compound to each gallon of solution intended for use. The articles should be boiled in perforated metal baskets until all dirt has been removed.

Q.—I would like a receipt for that silver paint for burning on glass.

A.—See article on "Silver Deposit on Glass and Porcelain" by Joseph Dimes in the January, 1907, issue of THE METAL INDUSTRY. Several hours are necessary for the firing part of the operation and the articles should remain in the retort or muffle until cool to avoid cracking. See our advertising columns for manufacturers of plating outfits.

Q.—I want a good dip for ormolu finish on sheet and cast brass.

A.—A good dip for ormolu finish on brass is composed of 1 part oil of vitriol and 1 part aquafortis. To each 2 gallons of the mixed acid use about 5 or 6 ounces of sheet zinc. To prepare the dip dissolve the zinc in the aquafortis. After cooling add the vitriol and well mix the acids. The bath should be used warm, but it is best to prepare the dip and let it stand over night and heat it up in the morning with a hot water bath. Note the following: When the finish is too rough add more vitriol; when too smooth add aquafortis. A little water added sometimes starts the bath to working more rapidly. The bath should be well stirred each time before immersing the work.

Q.—I am sending you a buckle. How is the blue finish put on? This buckle has been worn three years and the blue is not worn any yet.

A.—We do not think the buckle is copper plated but only tumbled until a highly polished surface is produced. The blue is afterward produced by melting potassium nitrate, commonly known as saltpeter, mixed with a little water and adding ½ oz. binoxide of manganese to each pound of nitrate used. This is melted in an iron pot until the compound boils. The articles are strung on iron wire and immersed for a moment until the blue is produced and then plunged in kerosene or paraffine oil and dried out in fine sawdust.

Q.—I have been experimenting with an electric zinc solution, but have not succeeded in plating it smooth enough for buffing. What I want is to make the zinc plating take the place of copper and then nickel plate afterward.

A.—We are of the opinion that you would not obtain very satisfactory results in coating steel with zinc and afterward with nickel. It would be necessary to have a specially prepared nickel bath for this purpose. In the regular sulphate nickel bath zinc blackens, even under the influence of the electric current. If you desire a higher finish use an acid copper bath in connection with your cyanide copper bath. A 20-minute deposit in this bath and afterward coloring on the buff will give you a finish upon steel equal to brass. In preparing the acid copper bath use 1 pound sulphate copper and 2 ounces oil vitriol to each gallon of water. Add 1 ounce glycerine to every 10 gallons of solution. The solution is used cold. Articles of iron, steel or zinc must be completely covered in

the cyanide copper bath before immersing in the acid bath.

Q.—Please let me know how the gun-metal finish is produced on iron?

A.—The black finish you refer to is obtained by heating the iron articles in a closed retort and then injecting live steam. This produces a very durable black oxide. The best imitation of this finish is to produce an optical dead black lacquer and apply the same as in lacquering; this gives exactly the same effect as the Bower Barff finish mentioned above. There is no other satisfactory method for the production of a dead black upon iron that we know of. The genuine Bower-Barff finish was described fully in the September, 1905, issue of THE METAL INDUSTRY.

Q.—Will you kindly let me know the formula for doing the enclosed coloring?

A.—The finish upon the sample submitted for inspection is not produced chemically, but is done by the method employed in French bronzing. To produce this finish proceed as follows: Procure some French bronze composition. Mix this with two parts of wood alcohol white French varnish and one part fusel oil to a thickness like thin paint. Apply to the articles with a camel's hair brush (½ or ¾ inch is the best size) exactly in the same manner as lacquering. Now dry out at a temperature of 180 degrees and allow to dry good and hard in the air. For the dark greens in the background prepare a plate color by mixing chrome green and lamp black with turpentine. Apply with a brush; in a few seconds this will dry. Remove the greens from the high lights with turpentine. Then reheat and when dry polish with cotton flannel.

Q.—Why do I have to run my brass solution partly green if I want to get good results? I am using carbonate of copper, aqua ammonia, carbonate of soda, with once in a while a little arsenic.

A.—If you are plating articles made from sheet steel your solution is nearly correct, although it shows a slight deficiency of free cyanide according to the color of the solution. A small amount of sodium bisulphite will do good if you wish to avoid an excess of cyanide by such addition. But a very small amount of cyanide added each evening and then well stirred will soon change the solution to its normal color.

Q.—Let me know the finish upon the cane head herewith sent you.

A.—It is a bright copper and lacquer finish. A solution for this purpose is the following:

Cyanide potassium	6 ozs.
Red copper compound	2 ozs.
Bisulphite soda	2 ozs.
Water	1 gal.

Dissolve the cyanide in 1 part of water and then add the copper compound; dissolve the soda salts in the balance of the water and mix. Use anodes of soft sheet or cast copper. The solution should be run warm. A fairly good deposit should be had in from ½ to ¾ of an hour. After removing from the bath the articles should be passed through a weak bright acid dipping bath to bring the lustre to the backgrounds. Buff with a soft wheel.

Q.—I would like a formula for a royal copper finish with the saltpetre method, also the phosphate of gold solution.

A.—The saltpetre method of producing royal copper consists of melting saltpetre in an iron crucible until fluid. and then adding just a little water. When this has been brought to a red heat the highly polished articles are immersed completely in the mixture for a few seconds. Then remove and plunge in paraffine oil. Dry in fine maple sawdust and polish upon a soft buff wheel, using powdered rouge mixed with wood alcohol. A little experimenting will give the desired results. The phosphate of gold solution consists of the following:

Phosphate of soda	8 ozs.
Bisulphate of soda	1½ ozs.
Cyanide of potassium	6 dwts.
Pure gold reduced to chloride	3 gal.
Water	1 gal.

In place of the above gold 7 dwts. of commercial neutral chloride of gold may be used. The best temperature is 180 degrees. Pure gold or platinum anodes may be used.

Q.—The enclosed sample of brass has been plated to get the necessary color, but as you know the plating requires considerable time and we have thought it possible that we may be able to use in this connection some kind of stain that would be quicker and not so expensive.

A.—You can produce a stain upon dipped or polished brass similar in color to sample in the following manner: Prepare a solution as follows:

Acetate of soda	2 ozs.
Hyposulphite of soda	2 ozs.
Water	1 gal.

This solution is used warm. Prepare a second solution consisting of

Sulphuret of potassium	1 oz.
Water ammonia	¼ oz.
Water	1 gal.

This solution is used cold. To produce the color clean the work exactly as for plating. Wash and immerse for a few seconds in the second solution. Then wash and immerse in the first solution for the same length of time. Repeat this two or three times and a fiery red will be produced. Wash, dry and lacquer with a heavy body lacquer.

Q.—I am having trouble with my antique finish on brass and am not certain that my process is just what it should be in order to produce the result I am looking for. Will you kindly let me have full directions for obtaining this finish?

A.—Light antique finish may be produced in the following way: Prepare a solution consisting of 2 ounces sulphuret of potassium, ¼ ounce water ammonia. This should be cold. Then clean the work in the usual manner. Then scratch brush the metal with a regular brass machine scratch brush which should not be too hard. The brush should be used wet with a little powdered pumice stone applied to the brush with the fingers. Clean the article again by passing through the potash and cyanide solutions. Wash and immerse in the oxidizing solution for a few seconds. Wash and dry with the aid of hot water and maple sawdust. Only a darkening of the metal will be noticed. Now scratch dry with a soft brush and immerse a second time in the oxidizing solution direct, without any cleaning, for a second or two only. Finally, wash and dry as mentioned above, when the color should be correct. If a little more lustre is desired, brush very lightly and lacquer with a good heavy lacquer. The yellow sulphide of antimony dissolved in caustic soda will give the same results with the same operations.

METALLURGICAL DIGEST

A REVIEW OF METALLURGICAL MATTERS OF THE WORLD.
TRANSLATED AND EDITED BY HOWARD GREEN BAYLES, MET. E.

CLEANING AND PICKLING COPPER-ALLOY CASTINGS.

(Concluded from the January Issue.)

RECOVERING THE DISSOLVED METAL.

The above method of cleaning castings is simple and cheap. In order to make it even more economical, a return well worth taking into account may be gleaned from the recovery of the dissolved metal. The casting skin removed by the dilute acid is largely made up of copper oxide. Beside the skin, some of the surface of the casting itself is dissolved. It is this sulphate of copper that makes the pickling bath grow a darker and darker blue as the acid gets more exhausted. Tin or zinc has also gone into the bath, but its recovery is not worth trying for. It is different in the case of the copper, however, especially as it can be so easily and cheaply precipitated by iron. To accomplish this it is only necessary to place in the solution wrought iron or tin plate scraps. In a short time the copper will be precipitated in small flakes and grains. Cast iron is not so good for this purpose, as it throws down the copper in a very dirty and impure state. In regular work on a commercial scale, it is most economical to use the dilute acid until it is entirely exhausted and must be replaced by fresh solution. If this is done, the iron precipitates the copper much more readily, especially if the solution is kept somewhat warm.

After the deposition is complete, the liquid is carefully drained off and the slime in the bottom of the tank is saved. This is not pure copper, but contains iron, silica, graphite and other impurities. By careful washing, however, a good deal of the dirt can be removed. The copper is then dried. It may be sold in this finely divided condition, it may be refined and sold in ingots, or it may be melted, skimmed and added to the metal for making fresh castings. The first mud, if dried, contains 94 to 98 per cent. copper. By melting and refining it can be raised to 98 to 99 per cent., which is pure enough for most casting work.

The recovery of copper by this simple method is considerable and sometimes surprising, for more metal goes into solution during pickling than one usually realizes. The recovery can only be made from the dilute acid, however, as with the concentrated or mixed acids the iron does not effect the same deposition.

PLATINUM.

In a recent number the Russian journal, *Le Messager des Finances, du Commerce et de l'Industrie,* publishes an interview with M. Gulichambaroff, a high functionary and in close touch with matters relating to platinum, concerning the present high price of that precious metal. The discreet statesman confined himself to the very safe opinion that the reason for this high price is that while the demand has been steady and even increasing, the output has diminished considerably during the past year.

The French weekly *La Metallurgie* makes this bit of oracular wisdom from Russia the text for an interesting sketch of the platinum trade of the world. The Industrial Platinum Company, with its headquarters and refinery at Paris, is not only the largest single producer of platinum in the Ural Mountains, but buys the crude metal from independent mining concerns. Thus nearly all the platinum that is mined goes through this single refinery, and the company acts as agent for the small producers in dealing with the syndicate of buyers, at the head of which is the firm of Johnson, Matthey & Co., of London. This jobbing is conducted on a curious plan.

In 1905 the French company paid for crude platinum, 83 per cent. fine, a provisional price of 12,000 roubles per pud, which amounts, in plain English, to 36 cents per gram. After refining and selling, the difference between the provisional price and the selling price, less 5 per cent. per annum interest on the sum advanced, 14 per cent. commission and 35 cents per lot of platinum handled, is paid over to the independent miner. This plan looks rather liberal until we realize that the platinum company makes the independent miner no allowance for the extremely valuable metals, iridium, osmium, palladium and even radium, that form the by-products of platinum refining.

The unusual features of the platinum industry do not stop with the buying, however, for at the same time the above-quoted price was current the refining company was selling to the buying syndicate for 66 cents per gram, plus a half interest in the profits from the sale of manufactured articles. Since that time the French company has paid as high as 84 cents per gram, plus the selling profit, for the crude metal, and consequent advances all along the line have resulted.

The total world production of platinum, under normal conditions, is about 10,600 kilograms a year. Of this 3,275 comes to the United States, England takes 3,050; Germany, 2,160; France, 1,880, and Russia only 125. Small consumers make up the balance.

A NEW ALLOY.

Le Moniteur des Interets Materiels announces somewhat mysteriously a new alloy, one element of which is aluminum, which will serve as a perfect substitute for platinum for every use. This sounds rather too good to be true, and it is hard to imagine that it will behave quite the same at blow-pipe temperatures or in the presence of some of the stronger acids. It recalls the aluminum-copper alloy enthusiastically exploited for a time, on the claim that it "will stand every test that gold will stand, except specific gravity." We do not see or hear much of it to-day, however. It is rather a pity, too, as some of this aluminum bronze does not tarnish in the air, and could be made into many beautiful and useful things, such as table ware, punch-bowls, etc.

A MINING BANK.

A French periodical calls our attention to the recent formation of a Mining and Metal Bank, at Frankfort, Germany, with a capital of 40,000,000 marks ($10,000,000). This will operate in collaboration with the powerful Metallgesellschaft, a sort of chamber of commerce for the metal industries.

Associations and Societies

REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN BRASS FOUNDERS' ASSOCIATION. President, Chas. J. Caley, New Britain, Conn.; secretary, Richard Moldenke, Watchung, N. J. The meeting of foundrymen, rolling mill men, platers, supply and other interests connected with the brass industry will take place Wednesday, May 22, at 10 A. M., at the 2d Regiment Armory in Philadelphia. This will be in connection with the convention of the American Foundrymen's Association. A special program will be provided and it is hoped that the much discussed organization of the brass interests along educational lines, similar to the work of the American Foundrymen's Association, will be effected. A special circular relating to the proposed organization of this association will be sent to those brass foundrymen and allied interests who have signified their intention to assist in this effort.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS. President, E. F. Needecker; Commissioner William M. Webster, 1110 Schiller Building, Chicago, Ill. The meeting of this society held in Milwaukee last month was one of the most successful in the experience of the society. A delegation from the Detroit Brass Manufacturers' Association attended the meeting on request or invitation, for the purpose of getting the National Association to further the cause they are fostering in the matter of shorter terms—to 30 days—doing away with cash discounts and establishing a minimum amount that freight allowance would be made on. The meeting also took up the question of making a uniform list on tubular goods and adjourned to meet April 9th at Cleveland, O.

The following firms were elected to membership: The Atlas Brass Works and the Regar Brass Works, both of Cleveland, Ohio.

AMERICAN FOUNDRYMEN'S ASSOCIATION. President, W. H. McFadden, Pittsburg, Pa.; secretary, Richard Moldenke, Watchung, N. J. The secretary announces that by invitation of the Philadelphia Foundrymen's Association, the next convention will be held in Philadelphia, May 21 to 24, 1907. We quote as follows from the circular just issued by the secretary:

"The elaborate system of working exhibits now being arranged for, which will surpass everything in that line heretofore attempted, will naturally draw a very large attendance, to judge from the splendid reception given the exhibits at the Cleveland convention. This exhibition will be open from May 20 to 26, and should be visited by every foundryman of the country, as nowhere can he see at one time and one place practically every improvement in foundry operations made in recent years—everything being right up to date.

"The papers promise to be as valuable as in former years, and I beg to urge our members to forward to your secretary short notes on points of interest connected with their work, which they can afford to give to the trade for the advancement of all. We have the difficulty of all secretaries in getting men of ideas to take a little time for this important work. Your secretary has heretofore repeatedly received pencil notes from his foundry friends, and saved the ideas for the convention papers. Kindly send us more pencil notes and we will do the rest most cheerfully.

"The exceptionally large attendance expected and hoped for has made an important change in the entertainment features imperative. As heretofore, the meetings of the association and the exhibits (in the 2d Regt. Armory, as well as the outdoor melting annex) are wide open to all visitors. The special entertainment, which includes the famous Philadelphia River Trip and Washington Park Shad Dinner, will be limited strictly to our members, all visiting ladies, the members of the affiliated associations, the visitors coming to attend the organization of the Brass Founders' Association, and those guests who secure the proper credentials for the special entertainment at the time of registration from the secretary of the association, who alone has been designated to pass on these matters. All others will be asked to contribute the sum of $5.00 (which is considerably short of the actual cost)."

THE FOUNDRY SUPPLY ASSOCIATION. President, S. T. Johnson; secretary, H. M. Lane, 610 Schofield Building, Cleveland, O. The preparations for the Philadelphia convention of the American Foundrymen's Association, and the exhibit of the Foundry Supply Association to be held in connection therewith, are progressing rapidly. During the past few weeks fourteen additional firms have joined the association and signified their intention of having exhibits at Philadelphia. The exhibit will be held in the Second Regiment Armory and will include all classes of foundry equipment and supplies.

For the benefit of the exhibitors desiring direct current, arrangements have been made in accordance with which an "Otto" gas engine will be installed, which will drive a Crocker-Wheeler generator. The balance of the power will be furnished by alternating current motors, the current being obtained from the Philadelphia Electric Company.

One of the most interesting features of the convention will be found in the exhibit of oil melting furnaces and the heavier pieces of equipment requiring foundations or pits, which will be located in a vacant lot adjoining the armory and covered with temporary buildings.

There is still considerable exhibit space available, but it is expected that the rapid growth of the association will soon bring the membershp up to such a number that all of the exhibit space will be taken.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION. Fred F. Stockwell, secretary, care Barbour-Stockwell Company, Cambridgeport, Mass. This association held its annual meeting and banquet on January 9 at the Exchange Club, Boston. The meeting was held in the afternoon and was well attended by members from all parts of New England. The report of the secretary showed a membership of 121 firms. The report of the treasurer showed a balance in hand and all bills paid.

The election of officers for the coming year was as follows: President, William H. Bense, Kingsley Iron & Machine Company, Canton, Mass.; vice-president, Henry F. Arnold, American Tool & Machine Company, Hyde Park, Mass.; secretary, Fred. F. Stockwell, Barbour-Stockwell Company, Cambridgeport, Mass.; treasurer, Geo. H. Lincoln, G. H. Lincoln & Company, Boston, Mass.

A committee of five was appointed to look into the charge of discrimination in the matter of freight charges as applied to Southern iron.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION. Howard Evans, secretary, care J. W. Paxson Company, Philadelphia, Pa. This association held its 16th annual meeting on January 2. The American Foundrymen's Association will hold its convention in Philadelphia in May, and the question of entertainment to be provided for the members of that association was discussed. No definite program has been decided upon. A paper on "Improved Attachment for the Wadsworth Core Machine," was read by W. O. Steele, of the Bateman Manufacturing Company, of Grenloch, N. J.

THE METAL POLISHERS', BUFFERS', PLATERS', BRASS MOLDERS' AND BRASS AND SILVER WORKERS' INTERNATIONAL UNION OF NORTH AMERICA.—Headquarters, Room, 409, Neave Building, Cincinnati, O.; president, A. D. Grout, Neave Building, Cincinnati, O.; general secretary and treasurer, Chas. R. Atherton, Neave Building, Cincinnati, O. The objects of the society are to improve the condition of the workers in the industry.

ASSOCIATED FOUNDRY FOREMAN.—Frank C. Everitt, secretary, care J. L. Mott Iron Works, Trenton, N. J.

ITEMS OF INTEREST TO THE INDIVIDUAL.

August C. Pieper has been admitted to partnership in the firm of Bruce & Cook, 190 Water street, New York, dating from February 1.

At the stockholders' meeting of the St. Louis Brass Manufacturing Company, of St. Louis, Mo., the following officers were elected: Edwin Guth, president; F. N. Eckerly, vice-president; C. M. Wemper, secretary, and O. B. Guth, treasurer.

At the meeting of the International Silver Company, Meriden, Conn., on the 10th ult., the following officers were elected: George H. Wilcox, president; George C. Edwards, Bridgeport, first vice-president; Chas. A. Hamilton, New York, second vice-president; C. H. Tibbits, Wallingford, third vice-president.

The Detroit Copper & Brass Rolling Mills, of Detroit, Mich., have elected the following officers for the ensuing year: L. H. Jones, president and general manager; Theodore D. Buhl, first vice-president; Richard P. Joy, second vice-president; Wm. F. Montgomery, secretary and treasurer; Frank H. Hoffman, assistant secretary.

W. S. Quigley, sales manager of the Rockwell Engineering Company, 26 Cortlandt street, New York City, who was to have started on a European trip in January, will not sail until February 16th. During his travels Mr. Quigley will visit every European country except Russia, remaining abroad until May 1. He will establish various agencies for Rockwell furnaces.

DEATHS

Samuel T. Bleyer, founder and former president of the Hawley Down Draft Furnace Co., Chicago, died on Wednesday, Dec. 19, after a long illness. Burial was made at St. Louis.

Patrick J. Flaherty, Fitchburg, Mass., superintendent of the brass foundry of William A. Hardy & Sons Company, died December 16, at the age of 38. Mr. Flaherty had worked for the company for several years and his knowledge of the business made him a very valuable man.

Andrew Corbin, one of the pioneers of the manufacturing industry of P. & F. Corbin, of New Britain, Conn., died at his home January 4. Mr. Corbin was born in West Hartford, June 16, 1833. When a young man he learned the jewelry business and in 1858 became identified with the company and he took an active part in its management throughout his life.

JAMES A. HAYDEN.

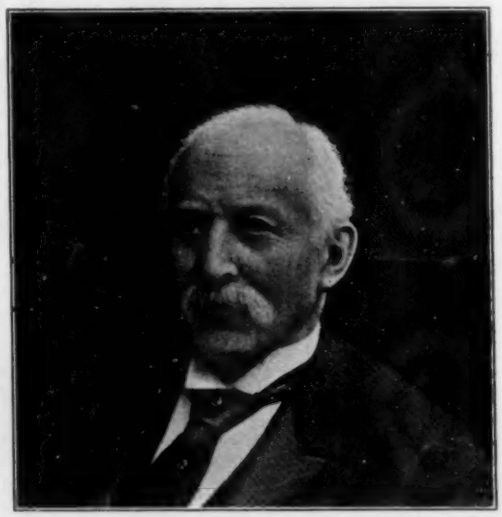
James A. Hayden was a direct descendant of John Haidon, who settled originally in Dorchester, Massachusetts, where he was admitted a Freeman in 1634, that is, formally recognized as one of our honored Puritan Fathers, and given full legal status and position in the community.

John Haidon afterward removed to Braintree, Massachusetts, where he was admitted a Freeman in 1640, and where he died. His will, dated Oct. 30th, 1678, is on record in the Suffolk Probate Office (Vol. 6, page 483) in Boston, of which city Dorchester is now a part, and Braintree a suburb.

James A. Hayden was born in Waterbury, Connecticut, on March 8th, 1825, and was a son of Festus and Sophia (Harrison) Hayden. Lemuel Harrison, of Waterbury, the father of Sophia, was a direct descendant of General Harrison, who was one of Oliver Cromwell's generals, and who sat upon the court which condemned Charles I to death. He came to this country with his sons on the downfall of Cromwell. He returned to England later on matters of business, and was there arrested under the charge of regicide, having voted for the execution of Charles I, and was convicted and executed.

James A. Hayden was educated in the old Stone Academy in Waterbury, and at Mr. Nash's school in Pittsfield, Mass. He came to the city of New York in 1844, and became associated with the wholesale dry goods firm of Williams, Rankin & Penniman, whose store was on the corner of Cedar and William streets, then the heart of the dry goods business. He afterward became the Co. of Murphy, Benedict & Co., of 79 Cedar street, who were in the same business.

He and his brother, Henry H. Hayden, were among the promoters of Holmes, Booth & Haydens, a corporation organized in Waterbury, Conn., in the year 1853, for the manufacture of brass and various articles made therefrom. He and his brother were for many years in charge of the New York office at No. 49 Chambers street, and their wise and energetic prosecution of the business contributed in no small degree to the great success of that company, which soon became one of the leading houses



JAMES A. HAYDEN.

in the business, and for years maintained a position and reputation second to none.

Mr. Hayden retired from active business in 1876, but remained a director in the Manhattan Brass Company of the City of New York, and a director and member of the Executive Committee of the American Surety Company, the pioneer company of its kind in America.

He occupied these positions until his death on January 22d, 1907, at the age of eighty-one years ten months and fourteen days.

Mr. Hayden married Harriet Whiting, a daughter of the Hon. James R. Whiting of this city, on January 26th, 1853, and leaves him surviving his widow, his daughter Miss Mary L. Hayden, his sons, Henry W. Hayden, who is a member of the law firm of Ward, Hayden & Satterlee, of No. 120 Broadway, and Dr. James R. Hayden, a professor in the College of Physicians and Surgeons, and one of the leading surgeons in the city.

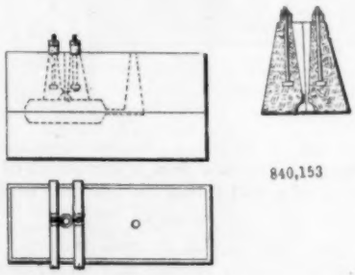
Mr. Hayden outlived most of his early associates, but left a host of friends to honor his memory. He did not amass great wealth, but left a spotless and honorable record which will not fade. His was that gentle courtesy of speech and heart which endeared him to all who came within the circle of his acquaintance, and his loss is mourned in genuine sorrow by his countless friends.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

840,707. January 8, 1907. WIRE DRAWING APPARATUS.. Geo. A. Paff, Sharon, Pa., assignor to American Steel & Wire Company, of Worcester, Mass. The object of this invention is to provide an attachment to the drawing block and its driving shaft by means of which the necessary amount of wire can be drawn through the die to permit its attachment to such block and which is so constructed and arranged as to be out of the way of the operator.

840,153. January 1, 1907. CASTING APPARATUS. George F. McKee and William F. Schilling, Aspinwall, Pa. This two-part flask is so constructed that one part of the flask may be removed without destroying the contained mold. A gate is pro-



840,153

vided for the flask which will permit of the flask being used for a plurality of castings, it being a well-known fact that heretofore the sand of the flask had to be repacked after each casting molded. The construction of the gate will be understood from the accompanying drawing.

839,577. December 25, 1906. PUNCH FOR METAL. Charles L. Gerds, Chicago, Ill. Heretofore hardened steel punches have usually been made with an integral enlarged or collar portion at their upper ends, to give the required broad bearing face against the plunger, the punch having but one cutting end. This punch is made double acting or reversible. It is made of the same shape and size at both ends and is provided with a split collar at its upper end which prevents the punch cutting into the face of the plunger.

838,977. December 18, 1906. SOLUTION FOR USE IN THE ART OF ELECTROTYPING. August Gerstner, New York City. This invention relates to a solution for use in electroplating and aims to provide a great saving in the number of steps required to produce the electrotype plate. The solution consists of nitrate of silver, chloride of sodium and graphite, which is applied to the mold for forming on the mold a thin coating of chloride of silver, which will combine with the copper in the electroplating bath to form a metallic silver coating. The application of the solution is intended as a substitute for a number of the steps now commonly employed in this process.

839,983. January 1, 1907. ELECTRIC FURNACE. William H. Bristol, New York City. This invention relates to that type of furnace heated by means of an electric heating coil of suitable resistance. The furnace may be quickly brought to full heat, and there is no danger of short circuiting or contaminating the heating coil. The heating chamber is formed of fused quartz, about which is placed the electric coil, which is inclosed in refractory materal.

842,111. January 22, 1907. PIPE BENDING MACHINE. H. A. Pedrick and C. A. Smith, Philadelphia, Pa. With this machine the character of the bend can be readily changed or varied in its diameter. Different sizes of pipe can be handled.

841,477. January 15, 1907. ASSAY BALANCE. R. G. Ainsworth, Denver, Colo. This invention is intended to provide an attachment for the ordinary assay balance to avoid the necessity of handling the very small weights usually employed in connection with this class of work. The smallness of these weights renders it difficult to handle them either by the use of tweezers or by taking them directly in the fingers. With this improvement so-called riders are employed to take the place of th very small weights. These riders take the place of weights from one milligram up to a number of milligrams.

840,789. January 8, 1907. GRAVITY MOLDING MACHINE. John E. Mitchell and Dennis Parks, of St. Louis, Mo., assignors to the Mitchell-Parks Manufacturing Company, of St. Louis, Mo. The object of the invention is to provide means for elevating and compressing the sand and finally discharging the same in unitary compact bodies at a point above the flask, so that the sand in falling will acquire a high degree of momentum so that it will pack closely about the pattern in the flask.

841,569. January 15, 1907. SAND MOLDING MACHINE. James Pickles, Bradford, England. This invention provides a sand molding machine which permits the usuer to manually ram the sand or to employ pressure exerting devices provided on the machine for carrying out the ramming actions. Provision is made for preventing danger or injury of the sand mold by the falling into or upon it of any loose sand or other matter after it has been formed.

839,506. December 25, 1906. SOLDERING IRON. H. H. McMullen, Brooklyn, N. Y., assignor to the Ideal Automatic Pump Governor Company, of New York City. The object of this invention is to provide an improved soldering iron which is provided with a reservoir or receiver for the soldering material which may be melted when desired for use and gradually fed as required to the operating point of the head of the instrument. The head is formed with a chamber for the solder which is fed through a hole to the point of the soldering iron. The flow is controlled by a valve operated by a rod extending through the hollow handle.

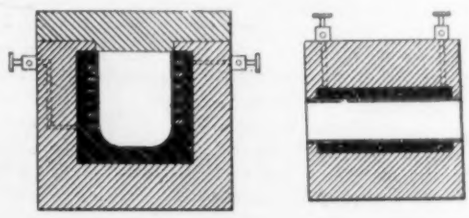
842,700. January 29, 1907. MOLDER'S FLASK. G. H. Rayburn, Columbus, O. This invention consists of a cope and a drag capable of being opened laterally, combined with a pattern board adapted to form a partition, and the whole being provided with effective means for holding them in perfect register.

842,625. January 29, 1907. BRACELET. R. C. Castiglioni, of Providence, R. I. In this bracelet the means for joining the parts are entirely concealed within the bracelet. This construction is intended to overcome the objections to the hinged form of joint and at the same time to produce a concealed joint bracelet which is simple and strong, and which does not require any special construction of the ends. It is so designed that it cannot be opened accidentally.

839,985. January 1, 1907. THERMO ELECTRIC GENERATOR. William H. Bristol, New York City. This invention consists of a thermo-electric generator comprising elements of high fusing

Fig. 1.

No. 839,983.



points forming a couple, and elements of lower fusing points connected to the elements of the couple. Provisions are made for compensating for variations of temperature at the junctions.

840,826. January 8, 1907. CRUCIBLE. Edward A. Colby, Newark, N. J. This is an electric furnace, or more properly crucible, for melting metals in which the charge forms a closed secondary circuit which is disposed in inductive relation to a primary coil, so that the currents induced in the charge operate to melt it. The crucible is annular in form and is made of a number of arc-shaped sections which are held together by dovetail keys fitting in dovetail recesses formed in the abutting edges of the sections. In case of injury to any section it can be removed and a new one substituted, so that the whole crucible need not be thrown away.

839,961. January 1, 1907. INGOT CASTING MACHINE. Nils H. O. Lilienberg, Philadelphia, Pa. With this method of casting ingots the molten metal is cast in a revolving mold, the object being to provide means by which relatively small ingots can be cast. The mold is cylindrical in shape and during the casting is revolved at a speed determined by the character of the casting desired. In this manner hollow ingots can be cast, the thickness of the walls depending upon the speed of rotation.

832,820. October 9, 1906. MAGNETIC SEPARATOR. F. T. Snyder, Oakpark, Ill., assignor to International Separator Company, Chicago, Ill. This invention relates to improvements in magnetic separator for the separation of materials of different degrees of magnetic permeability. The materials to be separated are repeatedly subjected to the action of the forces at work making the separation. It is claimed that a more perfect and economical separation can be obtained than has heretofore been possible.

834,803. October 30, 1906. APPARATUS FOR RECOVERING METALS. Wilbur A. Hendryx, Denver, Col. This apparatus is intended for the separation of gold, silver, copper and other metallic values from solutions containing the same, and more particularly from cyanide solutions of the precious metals. Such solutions are caused to pass through a filtering medium or envelope and into contact with a precipitating agent, which is covered or enveloped thereby. This filtering medium serves to separate the finely divided ore, slime or other matter and to leave the metal bearing solution clear.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

Walsh's Sons & Company, Newark, N. J., have 50 cypress electrolytic tanks for sale.

The Ensley Machine & Foundry Company of Ensley, Ala., have been incorporated; capital $10,000.

After an idleness of several years the Depew plant of the American Car & Foundry Company has resumed operations.

The Lattimer-Williams Manufacturing Company are erecting a new foundry at their plant on West Spring street, Columbus, O.

The Mahoning Foundry & Machine Company, of Youngstown, O., has been sold to the United Engineering & Foundry Company.

Bartlett, Hayward & Co., of Baltimore, Md., are building a new storage and erecting shop 59 x 130 feet, with a wing 70 x 84 feet.

Jacob Hofer, brass worker, of 381 Kent avenue, Brooklyn, N. Y., reports a very heavy business. He is far behind in his orders.

The Central Metal Furniture Company, Toledo, O., has been incorporated by Fred J. Miller and others; capital $10,000.

The Standard Foundry & Manufacturing Company of Dekaib, Ill., have been incorporated by S. M. Hunt, A. N. Wheeler and R. D. Hunt.

The firm of Cooke Brothers, of Traverse City, Mich., have dissolved partnership. The business will be conducted in the future by L. G. T. Cooke.

The Howard Machine Company has been incorporated under the laws of Massachusetts to deal in automatic weighing and vending machines.

Marshall P. Thompson, Boston, Mass., has been appointed receiver in the matter of the voluntary dissolution of the T. F. Tuttle Silver Company Corporation.

W. D. Labadie has retired from the Maurer, Labadie & Co., machine manufacturers of South Bend, Ind., and the concern will hereafter be known as William Maurer & Co.

Clayton Brothers, of Bristol, Conn., manufacturers of scissors, has changed hands. The new firm is composed of W. S. Bowes and S. L. Butler, who will retain the old firm name.

Plans have been finished for the new factory for the cabinet lock department of P. & F. Corbin, at New Britain, Conn. The building will be reinforced concrete, two stories high.

A foundry addition to the works of North Bros., Philadelphia, Pa., will be erected. It will be one story high and will cover an area 39 x 50 feet. The cost will be about $2,700.

The Stimis Metal Company of Newark, N. J., has been incorporated to manufacture metal goods by J. H. Hardman, F. Mirzwick and H. H. Stimis. Capital $10,000.

The Model Machine Works of Frankfort, Ind., has been incorporated with a capital of $10,000 by Joseph P. Palmer, Chalmers H. Hillis, Andrew A. Laird and B. F. Gable.

The Hoquiam Machine Works, of Hoquiam, Wash., manufacturers of tools and special machinery, have decided to erect a brass and iron foundry measuring 40 x 80 feet, two stories high.

The Southern Foundry & Machine Company, Birmingham, Ala., have been incorporated by John Daniel, John Armstead, C. H. Ungermann and W. J. Rushton, with a capital of $25,000.

The Rendall Metals Recovery Company, New York City, has been incorporated with a capital of $500,000. The directors are Charles S. Ashley of New Bedford and H. Carleton of Boston.

The Maywood Metal Company, Maywood, Ill., writes us that they pay spot cash for any amount of skimmings, grindings, sweepings, being particularly anxious to get hold of brass foundry skimmings and ashes.

Fred Bertuch & Company, Temple Court Building, New York City, is now supplying the San Francisco, Denver and Philadelphia mints and assay offices with their chemical stoneware and porcelain material.

John Platt & Company, Jersey City, N. J., have been incorporated with a capital of $25,000 for the manufacture of

machinery, motors and dynamos, by H. O. Coughlan, B. S. Mantz and J. R. Turner.

The National Foundry & Machine Company, New Haven, Pa., have been incorporated with a capital of $20,000 by E. N. Stahl, D. C. Springer, J. T. Johnston, J. B. Echard, F. L. Rocks and J. L. Cypher.

John Ahern has bought controlling interest in the firm of Ahern & Bergeron, of Nashua, N. H., Mr. Bergeron retiring from the business. The establishment is now working overtime on all kinds of plating work.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for quantities of brass nuts, copper rivets, crocus cloth, sheet brass and copper, sheet lead, solder, sheet zinc, etc.

The Hermance Machine Company, Wiliamsport, Pa., have built an addition to their works 40 x 145 feet. They are now doubling their foundry building and will put in the latest and most up-to-date foundry equipment.

The plant of the Genesee Plating Works, Rochester, N. Y., has been considerably enlarged and is now equipped to do all manner of die and machine work. The company is ready to undertake any kind of metal specialties.

The Sweet & Doyle Valve Company, of Troy, N. Y., have purchased the building owned by the Troy Laundry & Machine Company and are fitting it up as a foundry. They will probably add a brass foundry during the coming year.

The highest prices are paid by the American Nickeloid & Manufacturing Company, Peru, Ill., for any kind of scrap nickel, rolled or cast. The company desires to correspond with manufacturers or platers who have any of this material.

The name of the De Lamar's Copper Refining Company of Chrome, N. J., has been changed to the United States Metals Refining Company, and the capital stock increased from $2,000,000 to $4,000,000. Ernest G. Gothorn is the secretary.

The Gibson & Kirk Company, Baltimore, Md., have acquired the foundry and shops of Charles T. Gibson and the late Samuel E. Kirk. The company are prepared to do bell hanging, lock manufacturing, brass work of every description and electric work.

Arrangements are being made to establish in the United States, near Newark, N. J., a plant to make the Bates-Peard Annealing Furnaces. At present the Bates-Peard furnaces are built at Huyton, Liverpool, England. It is a furnace which anneals metals without oxidation.

The Willard Machine & Tool Company, of Cincinnati, O., have moved to larger quarters at 118 and 120 West Second street. They have added new machinery and other facilities for the manufacture of their line of power presses and special machinery for working sheet metal.

The W. Greene Electric Company, 81 Nassau street, New York City, are putting on the market variable speed electric lathe motors suitable for polishing, buffing, drilling, grinding, sawing, turning and lapping. Further particulars may be had from the manufacturers.

Arthur R. Haskins, of Oakland, Cal., formerly of San Francisco, is doing a large business in gas and electric fixtures, brass and iron railings, brass bedsteads, metal spinning, and gold, silver and nickel plating. This is claimed to be the only complete plant on the Pacific Coast.

The Partamol Company, manufacturers of a parting compound for parting molds of any size castings made in bronze, brass, iron, aluminum and other metals, have moved their office from 605 Broadway to 415 Broadway, where they have much larger and more commodious quarters.

The Harvey Hubbell Company, of Bridgeport, Conn., manufacturers of machine screws and electrical specialties, have perfected plans for an additional factory building. The structure will be steel-concrete, 52 x 115 feet, four stories high, with basement. Construction will begin March 1.

The Detroit Copper & Brass Rolling Mills, of Detroit, Mich., are now erecting a new copper mill. The building will be approximately 165 x 175 feet. By the first of April it is expected to have installed all the machinery for the most modern and up-to-date copper rod mill in the country.

The Union Stove Company, of Richmond, Va., incorporated with a capital of $100,000, will shortly erect a large plant for the manufacture of steam condensing coffee pots and air-tight heaters. The company would like to get into communication with manufacturers of cupolas, sheet steel, stove trimmings, etc.

The Waterbury Crucible Company, Waterbury, Conn., states that the output of their factory during the past year was three times larger than any year since they have been in business. They are therefore thinking of building an addition in the spring which will more than double their present capacity.

Two foundry supplies which are advertised at present by the Detroit Foundry Supply Company, Detroit, Mich., are core compound and parting charcoal. The quality and prices are announced to be right. The company also do a general foundry supply business and have a branch at Windsor, Ontario, Canada.

The Wright Wire Company of Palmer, Mass., are making extensive improvements. They are enlarging their boiler capacity, and a new 100-horsepower engine will take the place of the present one in their No. 3 plant. They are also erecting a second steel storage tank with a capacity of 90,000 pounds of sulphuric acid.

The Schreiber & Conchar Manufacturing Company, Dubuque, Iowa, are producing a mechanical electro-plating tank which the company announces cuts down the cost of plating. A description of these tanks was published in the January number of THE METAL INDUSTRY, and further particulars may be had on another page.

A new plating and polishing supply house is the General Lubricating Company, 1244 Belmont avenue, Philadelphia, Pa.; D. Miles Rigor, president; William S. Leib, secretary and treasurer; T. J. Ryan, general manager, and J. N. Green, superintendent. Besides platers' supplies the company manufactures oils, greases and mill supplies.

The William J. Oliver Manufacturing Company, of Knoxville, Tenn., are just finishing a very large foundry capable of turning out 125 standard car wheels per day. The floor will be covered by a travelling crane of 40,000 pounds capacity. In addition to their gray iron and wheel foundries the company have a well equipped brass foundry.

Wilmot Castle Company, manufacturers of sterilizers, hot air radiators and sheet metal specialties, are erecting on St. Paul street, Rochester, N. Y., a modern factory building 120 feet by 125 feet, with sawtooth roof. The front will be two stories, the second floor being devoted to offices. They expect to occupy the building early in the spring.

In December the W. P. Davis Machine Company, Rochester, N. Y., expect to move into their new store near the New York Central Railroad station, which will give them more manufac-

turing floor space at their present site, 120 Mill street, until their new shop is finished. The company manufacture machinery and a furnace for melting babbitt.

The works of J. H. Lingle Company, Bellefonte, Pa., were visited by fire on the 10th ult. The blacksmith shop, pattern shop and part of the boiler room were destroyed, involving a loss of $10,000, covered by insurance. New buildings are being put up as rapidly as possible. This firm makes brass castings for the local trade, having one furnace.

Reports fom Great Britain say that good progress is being made with the additional power supply scheme for the British Aluminum Company. The company is building a dam half a mile long, 80 feet high. Half a million sterling is to be spent in the undertaking. When the improvement is completed there will be a marked increase in the production of aluminum in the British Isles.

Milton P. Kahn, 18-20 Oak street, New York City, has been appointed Eastern representative by the Great Western Smelting & Refining Works, of Chicago, for the "Iron Fiend," which is guaranteed for its quality and which is being used by large consumers in this country and England for cleansing and purifying metals, particularly for taking iron out of brass while in the crucible.

The Driver-Harris Wire Company, of Harrison, N. J., have completed the erection of a patent annealing furnace purchased through C. M. Dally, 29 Broadway, New York City, and manufactured by Bates & Peard, of Liverpool, Eng. With this furnace they are now successfully annealing brass and copper. The furnace also takes non-ferrous alloys without difficulty and produces the best results.

The Rimmon Manufacturing Company, of Seymour, Conn., has a rapidly growing business in eyelets, grommets and brass goods. This company was organized seven years ago and has steadily increased its output and has enlarged its plant several times. They have a plating room and are now adding a brass turning deprtment. They expect to make a considerable addition to the plant in the spring.

Bastian Bros., manufacturing jewelers, electro-platers and badge makers, of Rochester, N. Y., are preparing plans for an addition to their plant. This addition will give the firm 15,000 square feet extra floor space and make their total area a little more than one acre. The addition will be 97 x 49 feet, three stories high, and will cost about $25,000. The machinery will cost as much more. It is expected that the new plant will be running about the middle of summer.

Sherman & Company, manufacturers of Sterling razors, formerly of 281-283 Water street, New York City, have removed their offices and factory to Keyport, N. J., where they purchased the large cutlery plant formerly owned and operated by the American Cutlery Company. The intention of the company is to manufacture not only the Sterling razors, but also a line of fine cutlery, particularly pocket knives. The company will employ about 300 men as foundrymen, grinders, polishers, case-makers, etc.

The Excelsior Brass Works, of Reading, Pa., have enough orders on hand to keep them busy until spring. They recently shipped a large order for solid brass cuspidors to the new Palace Hotel, San Francisco, and have now ready a large consignment of match boxes and trays for Florida. They have a contract for furnishing nickel plated display stands for Ingersoll watches. One portion of the works is devoted exclusively to chandelier work. The company also make all the brass fixtures to be found on a launch.

Merigold & Merigold, successors to Clark & Merigold, electro-platers, formerly at 48 Oliver street, Newark, N. J., have moved to 97 Chestnut street, where they have secured a large and roomy loft on the fourth floor of a brick building. Their new quarters measure 30 x 70 feet. They have a specially constructed hood or shed for their acid dipping; this permits the fumes to pass out and leaves the room perfectly clear. This firm has made rapid strides in the short time they have been in business and are now running their plant to its full capacity.

The Cleveland store of the Aluminum Cooking Utensil Company, a sub-company of the Pittsburgh Reduction Company, located at 2028 East 9th street, Cleveland, attracts considerable attention from shopping people. Every household utensil is attractively displayed. The store is in charge of Charles Fribby, who has a number of assistants which canvass Ohio. Beginning the first of the year it is the intention of the Aluminum Cooking Utensil Company to invade Chicago with a squad of one hundred canvassers, and they may also establish a Chicago store.

We have received from Geo. G. Blackwell, Sons & Company, Ltd., of Liverpool, England, makers and dealers in metals, alloys and ores, and producers of the well known "Lion Brand" metals, a very handsome and useful souvenir in the form of a two-bladed thin pattern pocket knife. The handle is steel, 3½ inches long. One side is marked with the name of the firm and their address, and the words "'Lion Brand' metals, alloys, minerals, furnace linings, etc." The opposite side is graduated along one edge in inches, 16ths, 32nds, and 64ths, and the other edge in centimeters and millimeters.

The Buhl Malleable Company, of Detroit, Mich., makers of malleable iron castings, elevating and conveying machinery, when sending an order to the Hanna Engineering Works, of 820 Elston avenue, Chicago, Ill., for parts for their pneumatic screen shaker said: "We take this opportunity of informing you that this particular shaker has been running in our core room for upwards of three years and averages seven hours continual work each day, sifting not less than 10 tons, and we have, therefore, no hesitation in saying that we are getting our money's worth on this investment."

FIRES

L. M. Leach & Co., repairers and refinishers of silverware, also gold, silver and nickel platers, suffered a complete loss by fire the past month at their shop, 62 Elizabeth street, New York City. They are looking for new quarters and expect that they will soon be manufacturing.

On the 20th of January the plant of the Hill & Griffith Company, Cincinnati, Ohio, manufacturers of foundry facings, supplies and equipment, was destroyed by fire, but the firm immediately made arrangements to resume business and in a few days were filling orders. Their core oven patterns were stored in a local foundry, enabling them to go on with their manufacture. It is the intention of the company to rebuild at once and have a better plant than formerly.

INCORPORATIONS

The Eastern Machinery Company, of New Haven, Conn., has filed a certificate of increase of capital from $30,000 to $60,000.

The Reama Silver Plating Company, of Springfield, O., has been incorporated with a capital of $50,000 by Jesse A. Clifton and others.

The Kemp Brass & Bronze Company, of Troy, N. Y., has been incorporated with a capital of $100,000 by C. M. Gilpin, H. O. Stuart, and G. O. Howard.

The Union Iron & Brass Works, of El Paso, Tex., has been incorporated with a capital of $50,000 by H. W. Gilbraith, W. J. Harris and John Franklin.

The Anchor Metal Novelty Company, of New York City, has been incorporated with a capital of $10,000. The directors are J. J. Matchett and R. W. Booth, Jr.

The Connecticut Metal Stamping Company, of New Haven, Conn., has been incorporated with a capital of $15,000. The company proposes to do a general manufacturing business.

The Gospens Iron Company, of Hoboken, N. J., has been incorporated with a capital of $350,000 to handle steel, iron, copper, manganese, etc., by W. H. Button, W. J. Jessup, and J. H. Reilly.

Articles of incorporation have been filed by the Brooks Foundry & Machine Company, of Niagara Falls, N. Y. Capital $50,000. Directors: George C. Brooks, Henry Bechtel and Stephen Blair.

Beaudry & Company, of Boston, Mass., have been incorporated with a capital of $10,000 for the building of power hammers and machinery. President, A. Beaudry; treasurer, O. Abiahamsen.

The Foil Metal Manufacturing Company, of Boston, Mass., has been incorporated with a capital of $100,000 for the manufacture of foil, metals, etc. The officers are: President, A. C. Burrage; treasurer, W. R. Russell.

A charter has been issued by the Secretary of State of Rhode Island to the Metallic Shell & Tube Company with a capital of $150,000. The corporation is constituted for the manufacture of stampings, tubes, rods, shells, etc. The incorporators are Henry E. Smith of Cranston, George B. Champlin of Warwick, and Leslie E. Hooker of Binghamton, N. Y.

The Fairfield Aluminum Foundry Corporation, of Fairfield, Conn., has filed a certificate of organization with the Secretary of State. The capital is $10,000. The subscribers to the stock are John H. Robinson, of Bridgeport; W. Herbert Jennings, of Southport, and Everett S. Bulkley, of Westport.

A certificate of incorporation of the Empire Blower & Pipe Company has been filed in the office of the county clerk, signed by John C. Kennedy and J. Frank Morse, of Rochester, N. Y., and George W. Harris, of Webster. This company is formed to manufacture blowers, dust collectors and pipes, their works being at 8, 10 and 12 Fraunce street, Rochester, N. Y.

PRINTED MATTER

Window Shade Adjuster. The Stone Shade Adjuster Company, of 1183 Broadway, New York City, have prepared a small folder dealing with their adjuster. This device lowers and raises the shade roller so that the shade practically serves the purpose of two shades.

"Addresscgraph." This rather formidable word has been chosen as the trade mark of the Addressograph Company, of 232-240 West Van Buren street, Chicago, Ill. A pamphlet just issued by them explains that the addressograph is a printing machine designed for office use. It will print 3,000 addresses per hour on anything required and can be operated by any boy or girl.

Brass Molders' Flasks and foundry equipment are covered very completely in a catalogue issued by the Oscar Barnett Foundry Company, of Newark, N. J. The company are now manufacturing circular flasks in their standard bevel style both plain and with ribs, two parts and three parts. The high standard of these flasks is always maintained and the various brass foundry supplies furnished by the company are all of the best quality obtainable.

Engraving Machine. A catalogue from the Eaton & Glover Company, of Sayre, Pa., describes their engraving machine intended for engraving work of jewelers. Their New Century machine will product inscriptions, monograms and what not that are perfect. There is practically no limit to the amount of reduction of the pattern, the machine not being limited to the usual reduction of 1-10. The machine will work as well on a ring as on a large piece and the result in each case is the same high degree of perfection.

"Hawthorne Works" is the title of a little booklet issued by the Western Electric Company, of 259 South Clinton street, Chicago, Ill., describing their new plant at Hawthorne, Ill. Since the completion of this plant the company have been in position to build heavy power apparatus and switchboards. The works at present comprise the following groups of buildings; office, pattern shop, pattern storage, foundry, forge shops and machine shops; the cable and rubber plants are located on the other side of the railway. In addition to these buildings there is a gas plant, water tower, tower plant, two crematory buildings, freight house and round house for locomotives.

Polishing Hoods.—A pamphlet by the Yuerhs-Breitmeyer Company, of Detroit, Mich., presents very convincing arguments in favor of their patent polishing hoods, which should be tried by manufacturers who do any amount of polishing, grinding, wiring, or buffing of brass goods. The hood is simple in construction and there is nothing to clog up or get out of order. It contains a pan directly under the wheel, partly filled with water, into which the brass polished or ground from castings is thrown by the centrifugal force of the wheel. The pan can be taken out whenever necessary to remove the accumulation of brass. The brass saved by this method is 80 per cent pure metal.

Foundry Supplies and Equipment. A complete catalogue and price list, No. 37, has been issued by the J. D. Smith Foundry Supply Company, of Cleveland, O. This company designs and builds iron, brass and steel foundries and manufacture foundry facings, supplies and equipment. This catalogue, of over 250 pages octavo size, describes everything used in the up-to-date foundry. The engineering department of this company is in charge of engineers of wide experience in designing and constructing complete foundry plants. They thoroughly understand foundry practice and are therefore in a position to appreciate all the elements in work of this character, from the handling of the raw materials to the shipment of the finished product. The company are prepared to design and build equipment to suit special conditions and are always glad to furnish estimates of cost.

Emery Wheels.—The Bridgeport Safety Emery Wheel Company, of Bridgeport, Conn., have prepared, in their 1907 catalogue, a most attractive and useful display of their emery wheels and grinding machinery. All their machines are made with the latest improvements, the result of many years' experience in the emery wheel and grinding machine business. There is no class of machinery where the strength and weight are more important and these machines are very heavy and rigid. The metal is arranged so as to reduce the vibration to the lowest point. Necessary changes to adapt the machines to the requirements of special manufacturing can be readily made and the company are constantly making new additions to their designs. Every machine is carefully tested before leaving the works. The company are bringing out a line of edge and surface grinders, which embody entirely new constructions.

Porous or Unsound Castings is the title of a small pamphlet which it would pay every superintendent and foundry foreman to read and to read carefully. It explains the cause of porous or unsound castings, this condition being made possible by the presence of free oxides. The deoxidation which takes place is attended by the formation of gases which cannot escape through the partially cooled walls of the castings and therefore remain in the body of the metal and cause the imperfections. It is very evident that if the oxides can be neutralized or deoxidized before the pouring of the metal it will be impossible for the gases to form. One of the best agents for this purpose is claimed to be metallic phosphoro manufactured by the New Era Manufacturing Company, of Kalamazoo, Mich., who issue the pamphlet from which the above has been taken. This material is an active reducing agent and deoxidizer, and its addition to the molten metal is said to insure perfect castings.

CARBORUNDUM. A card from the Carborundum Company, of Niagara Falls, N. Y., shows the original plant erected in 1896 and the present plant covering more than 6¼ acres of floor space. This plant produces every form of abrasive material, all made from carborundum. The rapid growth of these works shows the ever increasing demand for this material.

UNIONS. The Kewanee male and female union needs no nipple, for the connection is made direct with the male end of the union. The connection is a brass to iron, so that there is no corrosion. The ball joint seat does away with the use of a gasket. The union is composed of only three pieces and there are no inserted parts to become loose and cause trouble.

CATALOGUE BUREAU

METAL MARKET REVIEW

NEW YORK, February 11, 1907.

COPPER.—The London spot standard copper market opened at £105 15s., and prices steadily advanced to £109 2s. 6d. on the 14th, when prices gradually declined to £106 5s. at the close of the month, establishing a net increase for the month of 10s. per ton. The market in London standard copper is purely speculative, and prices made there are not in any way indicative of the actual copper market abroad, but the advance or decline in London copper does more or less affect dealers and buyers in America and also affects the price of "C" on the ticker. With the Standard Oil in control of Amalgamated, it is not altogether unreasonable to suppose that the fluctuations in the copper market may be the lever used for working the stock market. The price of standard copper in London to-day is about £3 below the highest, while the price of copper in America is at the highest. According to European statistics the visible supply of copper shows a decrease, since the middle of the month, of nearly 4,000 tons, but this decline in stocks is not reflected in any way in the price of copper in London.

In the home market copper continues to advance. At the end of 1906, 25 cents for copper was high; to-day Lake copper is nearly 1 cent per pound higher again. The advance has been rapid, abnormal and not altogether strictly legitimate. We have had floods in one district, shortage of labor in all districts, and scarcity of fuel as another serious drawback. These conditions are not normal and they come at a time when copper is most urgently needed. The talk from Boston about hidden stocks of copper is not confirmed by any facts and has not been taken seriously by consumers. The report was probably started to affect the stock market and apparently had its effect. The exports for the month of January are 16,639 tons, against 15,307 tons a year ago. The prices to-day for Lake and Electrolytic for March, April, May delivery range from 25½ to 25¾ cents. Casting copper, 24¾ to 25 cents, according to brand.

TIN.—The London tin market has toned down considerably. Spot tin opened at £193, the high price for the month, declined to £187 12s. 6d. on the 4th, and closed at £190 10s., showing a net decline for the month of £2 10s.

The New York market has ruled fairly steady, following the fluctuations in London. The consumption for the month is estimated at 3,900 tons, an increase over the same month last year of 50 tons, while the deliveries from London and Holland were 284 tons smaller than last year. The shipments from the Straits, however, were 1,300 tons lighter than January a year ago, and the statistics as a whole are rather bearish than otherwise and may mean slightly lower rather than higher prices for the coming month. The market to-day for 5 and 10 ton lots spot tin is 42.50 cents; futures, 5 to 10 points less; 1 ton lots, 42.60 to 42.50 cents for futures.

LEAD.—The foreign market for pig lead rules considerably below the New York parity. The fluctuations during the month have been very slight, opening at £19 17s. 6d. and closing at £19 13s. 9d.

In the New York market spot lead or nearby delivery lead is worth 6.25 to 6.30 cents in carload lots. The last price established by the Trust was 6 cents; this price has now been withdrawn and the Trust will only book orders to be billed at the price of lead on day of shipment. Consumers are absolutely at the mercy of the Lead Trust and there can be no possible relief until the duty of 2⅛ cents per pound is taken off this raw product. With spot lead very scarce and bringing a premium of ¼ cent per pound over shipment lead, the Trust will probably advance their prices at any moment. A consumer to-day cannot tell what his lead is going to cost him on any orders placed with the Trust. There are other sellers of lead coming into prominence, but the situation is controlled by the Trust for the benefit of the Trust, and the only thing consumers can do is to get together and agitate for a repeal of the tax on lead. Spot lead is very scarce; carload, 6¼ to 6.30 cents; smaller lots from store, to 6½ cents.

SPELTER.—Foreign spelter market has ruled easier and prices have declined over £1 per ton during the month.

In the New York market spelter has ruled very strong and prices are fully ¼ cent per pound higher than a month ago. Spot supplies are very scare and command a premium of about ¼ cent per pound over shipment spelter. The market closes spot carloads 7.15 cents, while carloads on the way can be bought at 6.90 cents. St. Louis holds firm at around 6.65 to 6.70 cents.

ALUMINUM.—This metal holds very strong, with the one producer way behind on deliveries. The nominal price is unchanged at 41 cents for ton lots, but no aluminum can be had at this price for the reason that consumption is ahead of production and for the time being we can only quote the market nominal 41 to 43 cents according to quality and time of delivery.

ANTIMONY.—The foreign market for antimony has worked off slightly. Halletts is quoted at £110 and "other brands" at £107, against £112 and £108 respectively a month ago.

Prices in the New York market have gradually been marked up to nearer the cost of importation, as we are nearly one cent per pound higher than we were one month ago. Cooksons to-day is held at 25½ cents, Halletts at 24¼ cents, Hungarian, etc., at 23¾ cents.

SILVER.—The price of silver during the month has declined about one penny in London and about 2 cents per ounce in New York. Closing to-day London official price 31 11-16d., and 68½ cents New York.

SHEET METALS.—The base price of sheet copper was advanced on the 17th of January 1 cent per pound to a 30 cent base, and on February 7 another advance of 2 cents per pound was ordered, resulting in a base price of 32 cents. Owing to the high prices that have prevailed for raw materials, the brass manufacturers have abandoned the old method of billing brass material with list and discount and have adopted net base prices for the various classes of sheet, rod, wire and tubing. The regular extras for size, cutting, slitting, sawing, drawing and quality are to be added to the base price after certain discounts have been deducted from these extras. The demand for all kinds of manufactured copper and brass sheets and tubes continues unabated and all the mills are behind on their deliveries.

OLD METALS.—The old metal market has ruled very strong and prices all along the line are slightly higher than a month ago. The scarcity of copper and the high prices ruling continue to help out all handlers of copper scrap and the market generally is in pretty good shape. Zinc dross is in good demand and is worth to-day 5¼ cents New York, carload lots. for No. 1 stock.

See Advertising Page 23 following for Trade Wants

Metal Prices, February 11, 1907

METALS.	Price per lb.
COPPER, PIG, BAR AND INGOT AND OLD COPPER.	
Duty Free. Manufactured 2½c. per lb.	
Lake, car load lots	$25.50
Electrolytic, car load lots	25.40
Casting, car load lots	25.00
TIN—Duty Free.	
Straits of Malacca, car load lots	42.50
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig lead, car load lots	6.25
SPELTER—Duty 1½c. per lb.	
Western car load lots	6.90
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	41.00
100 lb. lots	39.00
Ton lots	38.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons, cask lots	25.75
Hallets, cask lots	24.50
Other, cask lots	23,50
NICKEL—Duty 6c. per lb.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.50 to .60
MANGANESE—Duty 20%	.75
MAGNESIUM—Duty Free	$1.50 to $1.60
BISMUTH—Duty Free	1.50 to 1.55
CADMIUM—Duty Free	1.55 to 1.60
	Price per oz.
GOLD—Duty Free	$20.67
SILVER—Duty Free	68¾
PLATINUM—Duty Free	38.00
QUICKSILVER—Duty 7c. per lb. Price per flask	42.00

OLD METALS.	Price per lb.	
Heavy Cut Copper	22.00	22.50
Copper Wire	21.00	21.50
Light Copper	20.00	20.50
Heavy Mach. Comp	20.00	20.50
Heavy Brass	15.00	15.50
Light Brass	12.25	12.75
No. 1 Yellow Brass Turnings	14.00	15.00
No. 1 Comp. Turnings	16.00	17.00
Heavy Lead	5.50	6.00
Zinc Scrap	5.00	5.00
Scrap Aluminum, sheet, pure	30.00	32.00
Scrap Aluminum, cast, alloyed	25.00	27.00
Scrap Aluminum, turnings	10.00	13.00
Old Nickel, solid	18.00	25.00
No. 1 Pewter	31.00	32.00

	Price per lb.
SILICON COPPER, according to quantity	.37 to .39
PHOSPHOR COPPER, 5%	.26 to .28
Phosphor Tin	.47 to .48
Brass Ingot, Yellow	.16 to .18
Brass Ingot, Red	.19 to .23
Bronze Ingot	.17 to .21
Manganese Bronze	.20 to .22
Phosphor Bronze	.22 to .26

ZINC—Duty, sheet, 2c. per lb.	Price per lb.
600 lb. casks	8.90
Open casks	9.40

PHOSPHORUS—Duty 18c. per lb.	
According to quantity	.37 to .50

PRICES OF SHEET COPPER.

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb. sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	32	32	32	32	32	33
	Longer than 72 ins. Not longer than 96 ins.	32	32	32	32	32	33
	Longer than 96 ins.	32	32	32	32	32	34
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	32	32	32	32	32	34
	Longer than 72 ins. Not longer than 96 ins.	32	32	32	32	32	34
	Longer than 96 ins. Not longer than 120 ins.	32	32	32	32	33	35
	Longer than 120 ins.	32	32	32	33	34	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	32	32	32	33	34	36
	Longer than 72 ins. Not longer than 96 ins.	32	32	32	33	35	37
	Longer than 96 ins. Not longer than 120 ins.	32	32	32	34	36	40
	Longer than 120 ins.	32	32	33	35	38	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	32	32	32	33	35	38
	Longer than 72 ins. Not longer than 96 ins.	32	32	32	34	36	41
	Longer than 96 ins. Not longer than 120 ins.	32	32	33	35	38	
	Longer than 120 ins.	33	33	34	36	40	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	32	32	33	35	40	
	Longer than 96 ins. Not longer than 120 ins.	32	32	34	37	42	
	Longer than 120 ins.	33	33	35	40		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	33	33	35	38		
	Longer than 96 ins. Not longer than 120 ins.	34	34	36	39		
	Longer than 120 ins.	35	35	37	41		
Wider than 108 ins.	Not longer than 132 ins.	36	36	38			
	Longer than 132 ins.	37	37	40			

Rolled Round Copper, ⅝ inch diameter or over, 32 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 3½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, February 11, 1907

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb.....36c.
12 oz. and up to 14 oz. to square foot, per lb.....37c.
10 oz. and up to 12 oz.....39c.
Lighter than 10 oz.....42c.
Circle less than 8 in. dia., 2c. per lb. additional.
Circles over 13 in. diam. are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICES ON BRASS MATERIAL.

In Effect January 21, 1907.

To customers who purchase less than 5,000 pounds per month and over 5,000 pounds per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.22¾	$0.26	$0.28¼
Wire ¼" and larger	.23	.26¼	.28½
Wire smaller than ¼" to No. 8, inclusive	.23¾	.27	.29¼
Wire smaller than No. 8 to No. 10, inclusive	.24¼	.27½	.29¾
Rods smaller than ⅛" diameter	.23¼	.26½	.29¾
Rods ⅛" to 1" diameter, inclusive	.23	.26¼	.29½
Brazed brass tubing	.29⅞	—	—
Brazed Bronze and Copper Tubing	—	—	.33¼
Open Seam Brass Tubing	.27⅞	—	—
Open Seam Bronze Tubing	—	—	.31¼
Brass Moulding	.29⅞	—	—
Bronze Moulding	—	—	.33¾

15% discount from all extras.

To customers who purchase less than 5,000 pounds per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.23¾	$0.27	$0.29¼
Wire ¼" and larger	.24	.27¼	.29½
Wire smaller than ¼" to No. 8, inclusive	.24¾	.28	.30¼
Wire smaller than No. 8 to No. 10, inclusive	.25¼	.28½	.30¾
Rods smaller than ⅛" diameter	.24¼	.27½	.30¾
Rods ⅛" to 1" diameter, inclusive	.24	.27¼	.30½
Brazed brass tubing	.30⅞	—	—
Brazed bronze and copper tubing	—	—	.34¼
Open seam brass tubing	.28¼	—	—
Open seam bronze tubing	—	—	.32¼
Brass moulding	.30⅞	—	—
Bronze moulding	—	—	.34¾

5% discount from all extras.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 8½ in. O. D. Nos. 4 to 13 Stubs Gauge, 27c. per lb.
Seamless Copper Tubing, 32c. per. lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size.	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb..	35	34	29	28	27	27	27	27	27	27	27	28	29	31	33	34

GERMAN SILVER TUBING.

4	per cent.	to No.	19,	B. & S.	Gauge,	inclusive	$0.60
6	"	"	19,	"	"	"	.70
9	"	"	19,	"	"	"	.85
12	"	"	19,	"	"	"	1.00
15	"	"	19,	"	"	"	1.15
16	"	"	19,	"	"	"	1.20
18	"	"	19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 10 per cent.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 Feet. Brass.	Bronze.
⅝ inch	$8.00	$9.00
½ inch	8.00	9.00
⅝ inch	10.00	11.00
¾ inch	12.00	13.00
⅞ inch	14.00	15.00
1 inch	18.00	20.00
1⅛ inch	22.00	24.00
1¼ inch	25.00	27.00
1½ inch	32.00	35.00
1¾ inch	45.00	48.00
2 inch	56.00	60.00

Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than and including	*3in. 12in. in coils.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.	Polishing or Cutting to Length.	Satin Finishing one Side.
No. 13 and heavier	47	47	49	49	49	49	52	52	52	1	2
" 14	47	47	49	49	49	49	52	52	52	1	2
" 15	47	47	49	49	49	49	52	52	52	1	2
" 16	47	47	49	49	49	49	52	52	52	1	2
" 17	47	47	49	49	49	49	52	52	52	1	3
" 18	47	47	49	49	49	49	52	52	55	1	3
" 19	47	47	49	49	49	49	52	53	56	1	4
" 20	47	49	49	49	49	51	54	55	57	1	4
" 21	47	51	51	51	51	53	56	57	63	2	5
" 22	47	51	51	51	53	53	56	60	64	2	5
" 23	47	51	51	51	53	53	56	62	65	2	6
" 24	47	51	53	55	55	55	58	64	67	2	6
" 25	49	52	54	56	56	56	59	66	70	2	7
" 26	49	52	55	59	59	59	64	68	74	2	8
" 27	49	53	57	61	61	62	67	71	77	2	10
" 28	49	53	59	61	62	62	69	75	80	2	11
" 29	51	54	61	63	65	65	74	80	85	2	13
" 30	51	55	63	65	69	75	82	85	90	2	15
" 31	56	60	68	71	76	84	87	90	96	3	17
" 32	58	62	70	74	82	90	97	103	108	3	19
" 33	60	64	73	78	86	97	104	113	123	3	21
" 34	63	68	75	83	91	104	116	123	133	3	25
" 35	..	78	83	93	103	113	128	138	..	..	..
" 36	..	93	103	113	128	133	148	..	..	..	..
" 37	..	117	121	142	157	172	187	..	..	..	..
" 38	..	137	152	167	182	197	217	..	..	..	..
" 39	..	157	177	197	217	237	..	..	..	..	..
" 40	..	187	217	237	257	..	..	..	..	..	..

*Polished or scratch brushed 2 sides, double above prices.

In flat rolled sheets the above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are for 50 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICES LIST OF SEAMLESS ALUMINUM TUBING—STUBS' GAUGE.

Stubs' G.	¼"	⅜"	½"	⅝"	¾"	1"	1½"	2"	2½"	2¾"
4 to 11	..	..	96	86	83	77	67	61	61	61
12	..	1.08	96	86	85	77	67	61	61	61
13	..	1.08	96	86	83	77	67	64	64	64
14	..	1.08	96	86	85	77	67	64	64	64
15	..	1.12	96	89	86	80	70	67	67	67
16	..	1.15	99	93	89	83	70	70	70	70
17	..	1.18	1.02	96	93	86	73	73	73	73
18	1.85	1.24	1.05	99	93	86	77	77	77	80
19	1.88	1.28	1.08	1.02	99	93	83	80	80	83
20	1.95	1.31	1.15	1.08	1.05	99	89	86	86	89
21	2.01	1.37	1.21	1.15	1.12	1.05	99	93	93	96
22	2.17	1.44	1.24	1.18	1.15	1.08	1.05	99	1.05	1.05
23	2.33	1.50	1.31	1.24	1.21	1.15	1.15	1.08	1.15	1.15
24	2.48	1.60	1.37	1.31	1.28	1.18	1.21	1.21	1.24	..
25	2.65	1.69	1.47	1.37	1.34	1.28	1.34	..	..	..

Prices are for lots of 50 lbs. Boxing extra. Smaller, larger and intermediate sizes furnished by manufacturers.

PRICE LIST FOR ALUMINUM ROD AND WIRE—B. & S. GAUGE.

Diameter B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	43	43½	43½	44	44½	45	45½	46	47	48	49	52	57

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 30 per cent.

Munts or Yellow Metal Sheathing (14" x 48")	22c.	lb. net base.
" " " Rectangular Sheets other than Sheathing	24c.	" " "
" " " Rod	23c.	" " "
Tobin Bronze Rod	25c.	" " "

Above are for 100 lbs. or more in one order.

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For Index of Advertisements See Pages 30-31

FOR INDEX OF ADVERTISEMENTS SEE PAGE 31